FORMER NEBRASKA ORDNANCE PLANT

RESTORATION ADVISORY BOARD

BOARD MEETING

HELD IN MEAD, NEBRASKA

DATE: MARCH 23, 2006

TIME: 7:00 P.M.

Reported by Cynthia A. Craig
Videographed by John Thomas

GARTH ANDERSON: Welcome to the -- a special version of the restoration advisory board here for the former Nebraska Ordnance Plant site.

Appreciate everyone coming out in spite of the weather, I know it's kind of thawed a little bit, and -- but glad you could persevere.

MELISSA KONECKY: I had something I wanted to say before we start.

VIDEOGRAPHER: Use the microphone.

GARTH ANDERSON: Can we just go through something real quick, Ms. Konecky? We want to make sure that we -- everyone knows the rules of -- you know, with the transcriptionist and --

MELISSA KONECKY: Oh, yes, these are -- that's -- well, the rules with the transcriptionist aren't included in this, but some of the rules are.

GARTH ANDERSON: I'm also going to give you a microphone.

MELISSA KONECKY: This won't take long. I'm Melissa Konecky.

I'm Melissa Konecky, I'm the community co-chair for the RAB. I just wanted to say that I'm glad you guys could all come tonight to the special meeting.

After several requests of the Kansas City

Corps, they finally agreed to this special meeting to just specifically discuss the three groundwater models: The MUD 2004 groundwater model, MUD's 2005, and the Corps' own site model.

And actually the Corps had agreed to have a special meeting for the -- for the groundwater model back in November of 2004. Richard McCollum agreed to it and Natalae Tillman in August of 2005.

So that's what this meeting is about, just the groundwater models, and if you could hold your questions about other topics until two weeks from tonight, April 6th, we're going to meet here again at 7 o'clock for just a regular RAB meeting. So we'd appreciate it if you could hold your questions until then, I mean about other topics.

We're going to ask the Kansas City District to walk us through each of their specific comments regarding MUD's 2004 model, and each of their comments for MUD's 2005 model, and in addition to discuss their own site model, and there's a lot of information about those models that need discussing.

And from the community's point of view, personally I think it would be better if you have a question if you could ask it when the topic arises

rather than holding it until the end, otherwise, you know, people lose their train of thought, we don't have that slide up in front of us and have to, you know, search for it, and it might just be more time efficient and get more questions answered if we could just ask them as they come up, as the topic comes up.

And so I guess that was about it, so anyway, well, we'll get some answers this evening, so thank you.

GARTH ANDERSON: Thank you, Ms. Konecky.

Let's bring up the first slide, and let's run through the agenda real quick, please.

First some introductions and administrative items, then we'll review the actual agenda.

We have a presentation by the U.S. Geological Survey on concepts of groundwater modeling, just make sure everyone has a -- for the same level understanding of what groundwater modeling is all about.

And a question-and-answer period, we'll -- as we go through the presentation, it'd be better if we could hold questions until that -- until the end, but as Ms. Konecky said, you may have a question

that arises, but we would like to be able to let our presenters get through their topics as best they can.

Slide.

First introductions: You met Ms. Konecky, the community co-chair; I'm the army co-chair, Garth Anderson, I'm from the Corps of Engineers' Kansas City office; and then we'll go through some other restoration advisory board members.

Our active members of the board are Ms. Konecky and John Wageman, who's not here tonight, and then we have a number of inactive members that we haven't seen in a while.

We have some agency members that are here tonight. The primary ones are Mr. Scott Marquess, the Environmental Protection Agency, and Mr. Larry Angle of the Lower Platte Natural Resources District.

A couple other folks from the Kansas City District, Ms. Natalae Tillman and Jason Leibbert, who will be doing most of the featured speaking, and also Mr. Tom O'Hara from their Kansas City office as well.

Scott Marquess: Garth?

GARTH ANDERSON: Yes.

NEW SPEAKER: I want to introduce Bryan Rundell. He's -- he works for Tech Law, which is a consulting firm that supports -- provides technical support to EPA on matters like groundwater modeling, so he's up here to help me.

GARTH ANDERSON: We do have three gentlemen from the U.S. Geographical Survey, Mr. Greg Steele, who will be doing the main presentation, Rick Wilson and Mr. Swanson, who's -- who -- I guess you oversee both these guys, right?

MR. SWANSON: Correct.

GARTH ANDERSON: Excellent.

Okay. We're -- we scheduled this meeting until 9 o'clock, I think we'd all like to get out of here by then so we'll try to keep our discussions focused and on the topic.

Try to just ask one question at a time. We will have microphones that are going to be coming around, so please have a microphone in hand before you ask your question; and when you do ask a question or make a statement please state your name so our court reporter can get it down in the transcript.

Again, let's try to respect each other, keep it civil and listen to what everyone has to

say. Slide.

Just in case you hadn't figured it out by my gesturing up here, the meeting is being both videotaped -- actually, it's going on DVD, not videotape anymore, we've gone to the next level, and we have a court reporter who is -- will be providing the written transcript of the meeting.

Again, I just want to keep emphasizing stating your name because the video transcriptionist will call you out if you don't say your name, make you say your name, and to include me, I'm probably the worse offender, so he has my permission to smack me but only remind you guys.

We do have a mailing list. If you haven't signed in I urge you to do so so that we make sure our mailing list is accurate, and I've been compiling an e-mail list.

I've been sending lots of stuff out by e-mail lately because I think a lot of folks are moving toward that, and it's a pretty efficient way to disseminate some information, so if you're not getting a letter from me for these meetings please let me know so I can include you in the hard copy mailing.

Slide.

We do have a web site, project web site; it's getting better. We're posting information on there, it's -- we also find that it's a good tool to disseminate information to everybody in the community.

We'll post the transcript of this meeting, the slides, and sampling data when it becomes available; it'll all be right there on the web site, and I already talked about the e-mail list. Slide.

Okay. Again, the agenda, we're going to start with USGS just to talk about some groundwater modeling concepts; I won't steal his thunder, then we'll talk a little bit about our own groundwater model, the one we use to manage the site and do our pumping and containment.

Then we'll talk about our review of the MUD model, the 2004 and 2005 models, and then questions and answers, and hopefully we'll be out of here by 9 o'clock.

Slide.

Okay. At this time we'll go ahead and start with USGS who'll walk us through some concepts of groundwater modeling.

GREG STEELE: Hello, my name is Greg Steele, I'm with US -- there we go, I hope

that's a little bit better.

My name is Greg Steele, I'm with the USGS, I work in, Lincoln, Nebraska office, for the Nebraska Water Science Center. I've worked there about 22 years on different aspects of hydrology, from surface water, groundwater, water quality.

I originally started groundwater modeling when -- back in the days when computers had punch cards, so that goes way back into the '80s, and I've progressed up through the -- up through the computer models along with -- with the computers and the speed of the computers and all that, so I do have extensive experience in all kinds of fields related to the hydrology of groundwater.

Go ahead, please.

Today -- or tonight I should say, I'm going to give a -- an outline for the overview of groundwater modeling, and then I'm going to give some various approaches to the groundwater modeling, and then I'm going to give some examples of groundwater modeling.

Now, these examples themselves are going to be more of the Cliff Notes type examples; I'm just going to give you a brief overview for time sake.

Go ahead and advance, please.

But first I'd like to introduce the USGS to you. I'm not trying to make this a dog and pony show at all, but just to exactly tell you who we are and why we're here.

The USGS serves the nation by providing reliable scientific information, and the first bullet here is to describe and understand the earth along with the minimized loss of life and managed water resources enhanced to protect the quality of life.

Our vision is to be a world leader in the natural sciences through scientific excellence and responsiveness to society's needs, and society's needs includes all of society's, U.S. citizens.

Now, the strategic direction is to combine and enhance, but I wanted to point out that the scientific leadership and contribution to the resolution of complex issues, and complex issues by all means includes groundwater modeling.

So I'm going to continue on and hopefully you have a little bit of who we are and what we are, but above all we are -- we are a nonregulatory agency. We do not regulate anybody or anything like that, and we are a non-bias agency.

We collect the data, we analyze the data and we give it to the people that need it so that the managers can make the decisions that need to be made.

In this outline -- and it would be nice if you hold your questions to the end, but if you do not then that's -- that's fine too.

I will address the concepts of groundwater models, groundwater flow models, in particular MOD FLOW, and that's the one that I'm familiar with most, and that's the USGS groundwater model, and then I'm going to give some examples as I mentioned with groundwater models, and these are going to be USGS models.

What I will not talk about tonight is existing groundwater models in the lower Platte River Valley. I will not address the MUD model, the Lincoln model or the Mead model. We have not reviewed these models, these are not USGS models, and so I cannot address these models.

So we need a way to evaluate problems. Different approaches may require different tools that you use, and the simplest tools are the easiest, hence their name, excuse me.

And then you can press to more complex

tools, pardon me, but you need to consider the trade-offs between the simple tools and the complex tools.

What is the scientific question that you you're trying to answer? What are you trying to answer? The simplest tools are cheaper, but they're also faster to run, so you have to think about time; the complex tools are expensive and more time intensive, and they have increased personnel costs, so you need to have a -- an answer that is germane to the question that you're asking.

This diagram here shows--excuse me again--a database development at the base, and that is the data collection that you're -- that everything above it is based on.

So you have the geologic map models, hydrostatic models, groundwater flow models; all that building up to a quantitative understanding, and it's an iterative process, I'm sorry. So it's an iterative process that you go through, but you need to collect the data to obtain everything.

Go ahead, please.

So you have the simplest down here, the geologic models, they can be land form train models, whereas the hydrostatic graphic models can be the

definition of the aquifer, but the complex models are the groundwater flow models, those are the ones that I'll be talking about tonight.

But, again, it's all in an effort to get a quantitative understanding--and advance, please--for your ultimate goal in resource management.

Okay. Go one more, please.

Now, this is an analytical equation, this is one of the simplest models that we have. This is a stream depletion factor, SDF, and the analytical equation method that the Nebraska Department of Natural Resources used for the implementation of LB962, which is the integrated management for the surface water and groundwater.

And it's easy enough that you have a distance, and then you have a couple of aquifer properties, Storative or specific yield which basically in simplistic terms is porosity, and then a transmissivity is how easily the water moves through the -- moves through the aquifer.

But it uses seven simplifying assumptions, everything from a fully penetrating well to a fully penetrating stream and other things like temperature and stuff.

There are seven simplifying assumptions;

all these are designed so that the depletion is controlled by the transmissivity, the specific yield and the distance, and so the aquifer itself is very simplistic; however, the field conditions as Jacobson had said are never fully idealized in the real world using the above assumptions.

But the analytical equation, why do people use them, they're relatively simple to use, they're very easy. All you need is distance, you need a transmissivity and you need a storage specific yield factor.

Timewise they're not nearly as costly as a numerical groundwater model, and I'll get into that, what a numerical groundwater model is, after a bit.

And with the transmissivity and specific yield maps, you can use this analytical equation to map depletions over large areas for the -- using GIS, and that's exactly what DNR did.

Go ahead.

Now, you can also modify analytical equations to reduce some of the assumptions, and this is just some of the reports that have been recently published in ground -- in the Journal of Groundwater, such as a part -- accounting for the partial penetration of pumping wells, stream beds, a

distance to a boundary and cyclic pumping.

With analytical equations, it says steady state; in other words, the aquifer is not change -- or the flow in the aquifer is not changing, so you -- once the pump is turned on it stays on and once it's turned off it stays off; it is not a transient condition.

If you can go ahead.

Now, these can be put into what's called analytical models, and an analytical model is an exact solution of a specific yet a greatly simplified equation, a groundwater flow equation.

And these further reduce the number of assumptions by using some of the partial penetration of a stream and the distributed recharge and then a few other equations that will reduce the assumptions also.

One of the most widely known analytical models is the EPA's analytical model for the wellhead protection, and a lot of communities will use that to define a wellhead protection area for their community itself.

And it is nothing more than -- well, it's a software package containing four different modules; two of which are complete analytical

models, and one is a semianalytical, the other one is numerical.

But all -- they assume -- the analytical models assume that the flow in the aquifer is steady state; again, that the flow is not changing, it's not changing in direction, it's not changing in volume, and it's not changing in time, and it is horizontal, so it's a planer flow.

Go ahead.

Some of the inputs for the analytical model are your basic aquifer properties which are the transmissivities and specific yields again, that's a couple of them, your local gradient, which is the difference in your head in one spot over a head in a different spot over a unit distance, and the unit distance could be a foot, a mile, a kilometer or what ever.

And then you can also put in source boundaries and a no-flow boundary. A source boundary could be something like a stream; a no-flow boundary could be something like a bedrock or something like that. And then the well pumping rate, you put in a well pumping rate, but, again, the well is turned on or the well is turned off.

Now, we go back to this triangle here

where we're talking about the complex groundwater flow models, okay, and I'm going to talk about numerical flow modeling.

Now, the numerical flow modeling will take care of a lot of the more complex groundwater flow situations.

Now, the numerical simulation of groundwater systems, primarily finite difference in computer models. What this means is that you have a set of rows and columns and layers, and I'll get into that in a little bit, and they use a finite difference equations to solve for groundwater head in each of those -- the cells in those rows, columns and layers.

They're robust, they're very robust, they can solve for transient conditions where you have a well turning off and on or a stream turning off and on or, you know, the flow is starting, the flow is stopping, seasonal variations where you have trees that are mining the groundwater and then in the fall they'll stop mining the groundwater, that type of stuff, and they're better than analytical models for complex flow.

Now, for very simplistic groundwater flow you may want an analytical model, so you don't

necessarily need a numerical model, but for complex flow, they're definitely better than the analytical models.

You can also piggyback transport models. Something that will -- for like particle transport, chemical transport on to the back of these -- these models themselves.

But they simultaneously account for aquifer properties such as the thickness, the groundwater flow, they account for streams and rivers, evapotranspiration, the movement of water out of the system and through evaporation and transpiration with plants, water table configuration.

Now, in your models you may not have every one of these in it, your model may or may not have a stream, or it may or may not have evapotranspiration, the depth to groundwater may be of sufficient depth that you might need all of these, like that evapotranspiration, so you don't necessarily need every one of these.

The -- it's a simplification of the natural system. What you do is you assign properties to the model cells -- cells themselves. Like I said, you have rows, you have columns, you

have layers, so you assign properties to them, and each active cell is -- accounts for the total flow like -- like a bank, your checking account, the amount that you put in, the amount that you take out; these cells account for the water that goes in and the water that comes out.

Now, MODFLOW, which is the USGS's version of a numerical model, it iteratively solves for the water levels in each of these model cells using a numerical finite difference.

Now, there are other types of models available that do chemical transport or particle transport, heat and surface water and stuff; I just want to make that aware to you, but that won't be covered in this talk.

Now, MODFLOW itself it's not the only numerical finite difference model out there, there are other ones out there; however, it is world renown and it is the most widely used groundwater flow model within the USGS and outside of the USGS. This happens to be a cover page for the Chinese MODFLOW Manual.

Now, if we take the real system, how can we break this up into modeling, we have an aquifer here with sands and gravels, that would the

saturated part of the aquifer, then we have the clays, which would be the -- considered the confining units, which are of lower conductivity than the rest of it.

So the water does not move through the clays as much as it does through the sands and gravel so we need to account for all of that, and then we have a few wells within the system and also a stream in this.

Go ahead.

So we districtize it and it is flat, so, okay, there we go, we have the stream represented by this row and these columns, the wells are set within one in each column that we have a districtize in, we have the clay represented in these layers here, we have a five-layer model here is what we have --

The Aquifer 1 is in the first layer, the confining bed, the clay layer, is in this. Now, it's not continuous all the way across the model. It does pinch out here and it pinches out there, but it is represented in a thin layer right between these two zones.

We have Aquifer 2, we have Confining Bed 2, which pinches out of here but is still represented between these two, and then Aquifer 3

also.

Now, once you districtize your model area, you do not need to use each and every cell, and that's one of the good things about it.

You can assign which cells you want to use and which cells you don't want to use; your area does not have to be used by all of them. You can have one layer, you can have two layers, three layers, or however many layers that you want in the system itself.

So these wells on the corner -- or the cells on the corner here are considered inactive or no-flow cells.

Now, the model equations themselves, there is the assumption that within each cell, that the hydraulic properties are uniform, so it depends on your cell size as to how much certainty you have within them. Cell size can be however big you want to assign it, from ten meters or so to miles.

Go ahead.

So these equations down here, they govern the groundwater flow within the cells, and the one I want to point out with this is that there's an X component, a Y component, a Z component, and the W there stands for the sources and sinks; whether

there's a well in it, whether there's a stream in it or something like that, but they all come out to the change in head over change in time and the storage factor.

Well, these -- this S of S and Delta H over Delta T, that's the same thing over here basically, but your summation of all of the cues in and out, if you summed all these Xs and Ys and Zs together, that would -- so the Q is used for discharge; that's what we use to represent discharge.

So we have a summation of all the flow--we use Q as flow--that flows into a cell, then something has to change, it could be zero, but it -- that would be the volume, so it's a -- it's still accounting for everything.

So what can MODFLOW model in the real world? MODFLOW in the real world can model -- and if you can't read this, we do have a publication that can be obtained on site at our web site's -- I should say our -- obtained on our web site at this URL at the bottom of the page here, and hopefully you can at least read that.

But anyway, unconfined and confined aquifers, the unconfined one here which is -- has a

water table aquifer; the confined one, which is a fully saturated aquifer and confined such that the pressure would exceed or rise above where you encounter it.

Also it can model faults and other barriers like right over here, No. 2, fine grain and confining units; No. 3, these little different layers in conductivity, or rivers, drains and springs.

Now, drain in the spring, that is the difference between the river, and the drain in the spring, as far as the modeling is concerned, is the drains in springs groundwater just leaves the area; with the river, the groundwater -- or the water can enter the groundwater or it can leave the groundwater. It has interaction with groundwater itself, whereas with the drain, it just leaves.

And then the ephemeral springs, those -- or streams, those streams that just run on precipitation events. Model reservoirs recharge from precipitation, evapotranspiration, and then wells themselves.

Now, calibration, you want the -- you want the model to represent real world situations, and this is important, so your initial inputs are

estimated or measured.

You want to input stuff in field studies using the historical or perhaps you're carrying on a study itself, or maps, previous reports, stuff like that, you can get your climatic data from weather stations, you can get some of the pumpage if you have wells in your model area from some of the irrigators, municipality, industrial, and then if you have streams or canals in them -- in your model area then you'd also want to obtain that information.

Now, some of the input are held constant. If you know that better -- more then that's -- that's what we consider constrained. Say like your stream flow, if you know what your stream flow is, then you'd want to constrain it and keep that constant, so adjust everything else to it.

So the other inputs to it, the recharge values, you would adjust to the -- to the -- those that absolutely know, and these could be water levels too.

Okay. So you -- you start with reality, you start with what you know, your observ- -- your observed water levels and your discharge to the stream, and then you try to arrive at a point where

the groundwater irrigate -- or the groundwater -- simulated groundwater levels are going to be within some kind of predefined tolerance of your observed groundwater levels.

And this is important, that your discharges to the streams are also within some kind of a tolerance; that is, if you do have streams within your model area.

And nonuniquenesses is possible. That means that if you have two different models, the very same model, that you can have, if you match them to -- only to the water levels, that those water levels can be adjusted such that they could be totally different.

You can have one stream that shows, say, ten cubic feet per second, and the other one showing a thousand cubic feet per second. You can just -- it's all internally on how you go about adjusting.

And so you -- what you want to do and what you need to do is limit the nonuniqueness about it. You want to take what you know and limit everything and try to tie everything in together, and so that everything is calibrated to multiple observations, and so if you're calibrating to water levels, you're calibrating to discharge, you're calibrating to

recharge, so -- and the better models calibrate over transient time, meaning over time changes and time.

Go ahead.

Now, not all models are calibrated are the same, there are models that don't have streams in it so you can't calibrate to a stream. That idea, modeling should be built with specific purposes in mind.

I've built a model that -- up north by Maple Creek, and the specific purpose was to model groundwater flow from an agricultural field to a discharge into Maple Creek, so that we can determine some of the agricultural chemicals moving from the ag -- from the field to the -- to the stream.

You should have a purpose in mind when you are building these models. The process of building them and calibrating the model is instructive; in other words, you need to learn how the system behaves.

There may be data gaps that you discover or bad or erroneous data, that doesn't mean that it was bogus data, meaning that it was purposely done; that just means that there are instances where maybe a water level that was measured is way off, and you find out later that it isn't the water level that

was taken but, say, an oil cut in an irrigation well. A lot of irrigation wells might have oil in them.

And it's important to look at previous unidentified factors. Say there's a canal that was -- you didn't know about that all of a sudden happened to be lined, something like that.

Now, the uncertainty in models, you could have aquifer heterogeneity, meaning is the aquifer the same horizontally and vertically; that could be an uncertainty for the -- for the model; boundary conditions, what is preventing flow from going somewhere, the streams, bedrock, flow boundaries, that type; estimation of your model perimeters or your transmissivities, right, your specific yields, right, they could be off by factors of ten or more, depends on what you're doing; water use, that could be a very big uncertainty. You may not know how much water is being pumped by irrigation wells or other wells within your modeled area; and the climate, it could be raining in one part more -- it could be raining in one part of your model more than in another part, and that's some of the stuff that you can be uncertain about.

Now, the modeling process itself is

iterative. You start with the initial conceptual model, you build a computer simulation, then you run the calibration checks; do these match your targets within the predefined levels that you have?

If it's no, you look at either new data, reanalyze the existing data or so, you update your conceptual model and then you go through the process all over until you get a yes, and then have you a usable tool.

Go ahead.

So we'll take a look at a computer simulation, and this is a model that was done, and we're going to look -- go ahead, one more.

We're going to look at the water level rises from canals in this area, hopefully this will work.

One more.

These rises are from leakage out of the canal system, the tri-state canal -- I believe it's the tri-state canal system, so water levels within this area rose about 60 feet from 1940 to 1950 in this simulation here.

And if groundwater pumps were operating and there was no canal system, you certainly wouldn't expect a 60-foot groundwater level rise.

Go ahead.

So you do the calibration checks, and this series of dots represents the wells that were used for water level measurements. The thing to notice is that the yellow ones are within the simulated water levels -- targeted water levels of plus or minus 25 feet.

Now, that's a wide range, but the mean, or the average, water level was about two and a half feet dissimulated from the observed water levels.

The blues were above 25 feet, and the reds were below, but this is a well calibrated groundwater model.

Spring discharge, everything was within range except for the Brady to Cozad, and the only reason that that didn't fall within range is that part of this stretch itself, the reach of the Platte River, did not fall within the -- within the domain of the model.

Yes?

PAUL RANDAZZO: I was wondering how much longer your presentation --

VIDEOGRAPHER: You need the microphone.

PAUL RANDAZZO: Where do I get one at?

GREG STEELE: It's not very much longer.

PAUL RANDAZZO: How much longer?

GREG STEELE: I do not know.

PAUL RANDAZZO: It's your presentation; five minutes, twenty minutes?

JASON LEIBBERT: Hey, be nice.

GREG STEELE: I don't have --

PAUL RANDAZZO: It's very fascinating, very interesting; I just don't live in Cozad. I don't care about Cozad; I care about me.

GREG STEELE: I'm just talking about general groundwater modeling.

PAUL RANDAZZO: Okay.

GARTH ANDERSON: This is just a real-world example to show how modeling is done, it's just a -- so we understand what some of the basic concepts are.

PAUL RANDAZZO: I think we all understand.

NEW SPEAKER: Not everyone does.

PAUL RANDAZZO: All right.

NEW SPEAKER: So let him his finish his presentation so we can all understand what's going on.

PAUL RANDAZZO: I'm just a little bored.

GARTH ANDERSON: Go ahead, Greg.

GREG STEELE: So then what do you do with

a calibrated model? Those people do what-if scenarios, those are the most common, to determine future pumping scenarios, putting wells in, and so that's the most common. What happens in droughts, what happens in changes with development, that's your most common.

Then you can also do future studies, advanced modeling techniques. You can take your regional model, scale it down to a local model, and then, of course, you can continue to update the model too.

So a few examples, this is a Virginia Coastal plain model, and this one is not even Nebraska so I apologize to those that don't live in Virginia, but anyway please continue.

The purpose of that one was to show it -- that had 96 layers, so the purpose of that last one was to show that you're not constricted to only a single layer; it did have 96 layers within it.

The Elkhorn Loop Model is one that we're working on here in Columbus and Norfolk, and it's a large model, and, again, you have rows, you have columns, you have layers in each of these models, but that -- once you take out the inactive cells, then that leaves you the active cells, and it does

not have to be a rectangular shape.

So continue.

The Elkhorn Loop Model is a regional groundwater flow model for the integrated resource management tool, and it's to compile the information on the system itself and characterize how this system behaves.

Okay. So in summary, there are many different tools that can be used. The models, they're also the tools, but no one model itself fits every situation. All tools require data, and then the groundwater flow model in itself is an iterative process of data input and calibration.

So are there any questions?

MIKE RYAN: Mike Ryan, I'm from Omaha.

Why would the MUD model for their well field be any better than, say, a weather service model predicting the weather? What -- what would make MUD's model more accurate? Let's assume it's more accurate, why would it be more accurate than a weather service model?

GREG STEELE: Those are like comparing apples and oranges; you're using a -- two totally different models. You're using a groundwater flow model and you're using a weather model.

MIKE RYAN: But we all know how inaccurate weather service models tend to be. I mean, it's better to use them than what we had, say, 30 or 40 years ago, but we still know they're inaccurate. What -- you know, why wouldn't a groundwater model be just as inaccurate?

You've got different variables, granted, but you still got variables and, you know, my thought is that the variables in a weather model are probably more observable than variables in a groundwater model.

GREG STEELE: I'm not going to comment directly on the MUD model. I do not know enough information on the MUD models. What I will say is that the groundwater models in general, they're only as good as the information that you put into them. That includes our Elkhorn model, our Loop model, our Cozad model, that includes the Virginia model.

So it really depends on how you districtize the -- how small you make your cells, how accurate you make them, and it all has to do with the groundwater flow equations of -- and keep in mind, the groundwater does not change nearly as fast as what the air does.

MIKE RYAN: Okay.

GREG STEELE: The mediums are totally different. The groundwater, the temperature stays relatively the same, the air temperature does not, the groundwater temperature stays relatively the same.

MIKE RYAN: Yeah, but your flows change, you know, they're affected by weather, as you said, and you try and take that into consideration, and your seasons change and you have more evaporation at sometimes.

I mean, you've still got variables. It just seems like a model is a little better than an educated guess, and you can't say, you know, with a great deal of certainty, you know, what's going to happen.

You can't say that these gargantuan wells that MUD is going to put in are not going to affect the Mead site or the contaminants coming from the Mead site. I don't think they can say that until they flip the switch down there.

GREG STEELE: Well, again, I can't -- I can't comment on that. All I can say is that groundwater model in general, if it's -- if it's designed properly, it is designed for the specific purposes, and each of them, they have their own

purpose from which the designer has made it, and they can answer a lot of questions.

They can't necessarily answer every question and they don't necessarily coincide with every question being answered that comes up in the future. You may have to collect more data and adjust the model as you see -- as you see fit.

MIKE RYAN: Now, you said you can't comment on the MUD model because you haven't analyzed it yet. Has USGS been paid by MUD at any point in time to do any analysis of their work product or models that were done for MUD or by MUD?

GREG STEELE: No, absolutely --

RICK WILSON: Well, Greg, we have done water quality sampling on their wells, but we have not looked at any model.

GREG STEELE: Not water, no, not modeling, and that's what he asked.

MIKE RYAN: You've done sampling?

GREG STEELE: We have done -- we have done sampling, but we do sampling for other folks too.

MIKE RYAN: But you've done it for MUD?

GREG STEELE: We've done it for NRDs, we've done it for the -- many NRDs, many entities. As I mentioned when I -- when I started off my

presentation, that we're a nonbias organization. We collect the data, we give it to the people that need it, and then we have a set protocol that is the same throughout the United States.

MIKE RYAN: What kind of sampling -- I'm just curious, what kind of sampling?

RICK WILSON: Rick Wilson, I'm with the USGS.

If you go to their web site and go to new West Platte Valley neighborhood, you can go there and you can see all the analytical results from the three periods of sampling that we would have conducted for MUD.

And you can see all the different compounds that we have looked for; primarily RDX and also some of the organic solvents, and you'll see that listing and the results that we found, and we didn't find any, but they're always listed on their web site.

MIKE RYAN: Okay. And I believe I looked at the web site, and I think they paid USGS a hundred thousand dollars for that work.

RICK WILSON: Yeah, that's about right.

MIKE RYAN: Okay. Thank you.

GREG STEELE: Yes.

LYNN MOORER: Lynn Moorer, M-O-O-R-E-R. I have a question.

Mr. Steele, do you have a contractual relationship with the Kansas City Corps of Engineers or any district of the Army Corps of Engineers; that is, the USGS?

GREG STEELE: Contractual, in what -- in what way?

LYNN MOORER: Do you have a contract with the Kansas City --

GREG STEELE: I understand the --

LYNN MOORER: -- Corps of Engineers?

GREG STEELE: -- contract. I meant in what process? We do surface water, we do surface water I do believe.

LYNN MOORER: What do you mean by do, you do --

GREG STEELE: Well, you asked if we have a contract. We run surface water gauges.

LYNN MOORER: I'm sorry, I didn't hear you.

RICK WILSON: This is Rick Wilson again.

As a government agency, we do not contract the interagency agreements, and we do with Kansas City Corps of Engineers, the Omaha Corps of

engineers and many of the state and local agencies as we pointed out; so we don't contract, we're a government agency, but we do have agreements.

LYNN MOORER: All right. So do you have -- does the USGS have an interlocal agreement with the Kansas City District of the Army Corps of Engineers?

RICK WILSON: We have several.

LYNN MOORER: And the subjects or the general work or the agreement covers what just generally; what do you do for them?

RICK WILSON: The majority of the work that we've done for the Kansas City District has been stream gauging, water measurements in the streams and rivers in the state of Nebraska.

We have done some other investigative studies, primarily geophysical investigations where we do subsurface investigations with remote sensing tools, so those are the two primary types of agreements that we have with the Kansas City Corps of Engineers.

LYNN MOORER: So it'd be fair to say you don't have an agreement of any kind with the Kansas City Corps of Engineers with respect to modeling?

RICK WILSON: None.

LYNN MOORER: Therefore, what Mr. Steele is saying this evening is simply USGS's view, but it is not speaking for the Kansas City Corps?

GREG STEELE: Absolutely.

LYNN MOORER: All right. So we still do not know the Kansas City Corps' views on these models yet; we have the USGS's views, but they don't have a relationship in which they are speaking on behalf of the district, correct?

GREG STEELE: No --

GARTH ANDERSON: Yeah, this is Garth Anderson, that's exactly the reason we brought them in here tonight because they are a neutral with respect to the groundwater modeling at the site, and they're international experts on groundwater modeling, so no better authority to talk general concepts than USGS.

LYNN MOORER: We appreciate the clarification and the perspective, just so folks understand, the point of this meeting, though, is to hear the Kansas City Corps' views of these three models, so I felt it was important people understand we haven't gotten that yet. We're hearing the USGS's views, but they're not a contractor or a --

have an agreement relationship for the Kansas City District.

GREG STEELE: Right --

LYNN MOORER: Thank you.

GREG STEELE: -- but you're not hearing our views of the model; it's just our views of groundwater modeling. I want to clear that up.

GARTH ANDERSON: Okay. It's pretty clear.

WANDA BLASNITZ: Wanda Blasnitz (phonetic). I had three questions.

One may be a little bit related to what the gentleman was asking about accuracy because you mentioned that there's uncertainties, and I understand that, you know, you have to make an estimate and then as you get data you put back into the model, and you keep building a better model if that's the correct way to explain it.

What I guess I was wondering with your experience of having done this, once you've used the model and then you've seen what happens in reality, so there would be some way to tell how accurate maybe a model was for the way it predicted something, have you found that there's some models -- and I don't know whether when I say model I mean software, some kind of model that is better

than another one?

GREG STEELE: Yes, I've looked at some models that are better than other ones. For instance, we've done -- done one in -- we, the USGS, did one in California, and it was in the San Joaquin Valley, and it matched up very well with the predicted heads as --

And one of the things that you can do is if you have a recorder well or as some would say, a long-term observations of the water levels over an aerial extent so that you have many, many points to match the model to, and if you can get the model to match those, then you -- it is a good fit, and if you can get the water balance to match.

So it's just not a matter of matching heads; it's a matter of matching the water balance, so the heads, the discharge and stuff, so there are very good models out there.

WANDA BLASNITZ: With those models, I mean can you give it a percent accuracy like the one that you described in California?

GREG STEELE: No, I couldn't give a percent accuracy.

WANDA BLASNITZ: And I appreciated your explaining how the models work, and I was just

curious, you know, when you had the pyramid up there, is the Corps' model that they use for this site numerical, analytical, or where did it fall on there if somebody -- I know you --

GREG STEELE: I don't know.

WANDA BLASNITZ: I just wanted to ask it before we went forward since you did such a good explanation.

GREG STEELE: All of them fell within the groundwater modeling except for the analytical equation, and that would -- and that would semifall within here, but the analytical model and the groundwater flow model, the numerical model, they all fall within here.

WANDA BLASNITZ: Is the Army's model numerical or analytical?

JASON LEIBBERT: Jason Leibbert with the Army.

Our model is numerical and we use the USGS MODFLOW code to do the modeling.

WANDA BLASNITZ: And when was the last time the Corps' model was updated to include new data, actual data?

GARTH ANDERSON: We're going to be covering that in just a few minutes, so if you can

hold tight we'll get right to that.

Garth Anderson with the army.

WANDA BLASNITZ: Thank you.

GARTH ANDERSON: Okay. That looks like all the questions on USGS's presentation. Greg, thanks for your time. I appreciate your coming out tonight.

At this time we're going to have Jason Libbert who's probably going to be talking for the rest of the evening here on both -- on both Kansas City District's model and our -- some comments on the Corps' review of the MUD model.

So Jason if you'd take it away, get a drink and --

JASON LEIBBERT: Okay. So we'll go through, we'll talk about the Army's model, the one that we've developed, we'll talk about comments that we've received on that model from a couple of different agencies, and then we'll talk a little bit about the MUD model.

Next slide.

So one of the things I wanted to point out tonight is kind of the purpose for the model, the groundwater model that we've prepared, and how we use it to manage our site.

And we call this the remedial design groundwater model, so throughout the course of the night when I call it the RDGM model, that's ours, that belongs to the Army Corps of Engineers, that's the one that we've developed, so just remember that acronym, RDGM.

The RDGM model is really just a tool that makes predictions about where the groundwater is going to flow and how fast it's going to flow, what direction it's going to flow, and that's -- at the heart of it, that's what the model does; that's the most simple explanation of the groundwater model, is you feed it information and it makes a prediction about where the water is going to go.

And then also with the model you can make predictions about what's going to happen if you add some sort of outside influence. If you add a pumping well into that system, that'll change the direction of flow, it'll change the velocity, it'll change how fast the water flows; you can put that into the model and you can make predictions about where the water is going to go under those conditions as well.

And really what we use our model for is to help us understand if our extraction wells are truly

capturing the contaminated groundwater; and that's really what the basis of our model is.

It -- we -- it makes predictions whether or not our extraction wells are capturing, are they pumping hard enough, are they capturing all the contaminated groundwater, is all the water flowing into our wells the way it's supposed to be.

That's how we use the model, is to make predictions, and then we go out and collect measurements to see if those predictions are right, and then as Greg described, put that information back into the model, and it's a cycle of continuous improvement.

So this is a graphic that's actually a little bit similar to what Greg provided, and I want -- I want to really make this point, that the model that's kind of this continuous process, you start by giving it information you know about the site.

We take water level measurements from different wells, we take different level measurements from the different streams and the rivers, we know how much some wells are pumping, we know how much it rains in a year, we know how much irrigation goes on during a season.

We put all that information into the model, and then it makes a prediction about what's going to happen; you know, groundwater is going to go this direction or it's going to go this direction or it's going to be captured by our extraction wells or it's not going to be captured by our extraction wells; that's what the model tells us.

And then the last step in the process is we go out and we take measurements to see if any of those predictions actually came true or not.

And that's the part of the process that I think has been missing from a lot of the discussions, is that once you do the model in the computer, you makes the rows and the columns and you do all that stuff.

Now, that's very labor intensive to do in the computer, and all that information lives in the computer, and it doesn't really mean anything until you go out and you collect those measurements, and that's what we're doing right now, is taking those data, taking those measurements, and checking it against the model.

Next slide.

An we've been doing this for about the past ten years. The Corps' first conceptual

groundwater model for the site was in 1996, and then we made predictions and we collected more information, and we put that back into the model in 1998, then we went through that cycle again in 2002, and then we went through that cycle again in 2004, and then we did it again in 2005, and we're going to do it again this year in 2006, so that we're continuously working on the model.

It's not a static thing that once you finish it you put it on the shelf and you never look at it again and you go on to the next thing, is that always work on the model, and you're always working to make it better by feeding it more information.

So, again, you know, as the model continues to grow and continues to -- as we continue to add more information in the model, it continues to get better over time, and that it can make predictions better now than it could three or four or five years ago because we have more information now than we had three or four or five years ago.

So, again, this cycle, this kind of do-loop thing is something that we're always going to do with the groundwater model. As long as we're out here at the site, as long as we have a cleanup project to perform, we're going to be doing this

with the model, so it's not a one-time thing, it's not something that's ever truly complete even though we -- we write a report about what we find with our model and we compare it to the results and we talk about calibration and we talk about sensitivity analysis and we talk about hydraulic conductivities and all that.

And that's good, the report is a good document to show how well of a job the model is doing, how well the model is working, but that we never really just set that aside and move on; we continue to update the model and make it better over time.

So one of the things that I want to -- also want to talk about is kind of the difference between the Corps' RDGM model and the modeling work that MUD has performed.

And they're similar because they cover kind of the same areas, but they're different because they have two different purposes, and our model is designed to help us manage our cleanup project.

We have a number of extraction wells as you probably know, and they all pump groundwater and they all go to our treatment plant, and that's how

we're trying to clean up the aquifer here. Our model does a really good job of helping us verify how well those extraction wells are working.

The MUD model is much different in purpose; they're looking at a very broad area. Their model covers a much broader area than our model does, the MUD model is very much interested in its interaction with the Platte River, the MUD model is very much interested in drops in water levels around different landowners that may or may not be impacted by MUD's operation, and it just so happens that there's this Mead Superfund Site inside the area that MUD is trying to model.

Now, this is important to MUD, they need to pay attention to us and they need to demonstrate that they're not going to have a negative impact on us, but that's not really the point of their model. Their model is more on a regional scale and trying to show effects across the whole region due to their operations.

So their -- the RDGM model and the MUD models are -- again, they've very similar in a lot of ways because they have to be, but they're also very different in some ways because they serve different purposes.

Go back.

A couple other points I wanted to make, the RDGM model, you know, we can simulate the MUD well field and we can simulate the Platte River because we have to because we have to be able to account for those interactions in our work that we do, but that's not really the focus of our model the way it is in MUD's.

So we have kind of the same information that MUD has, but that's not really the objective for us. Our objective is more a demonstration of successful containment, and this is the cleanup project working the way it's supposed to, that's the purpose of ours.

So one of the topics to cover tonight is the Saunders County Board of Supervisors hired a consultant last year to review the MUD model, and in doing that work that consultant also looked at some of the RDGM reports; a report from 2002 and a report from 2004.

And when the consultant wrote his comments back to the Saunders County Board, there were a few statements and a few comments that were about the RDGM model, so one of the things that we wanted to do was to kind of respond to those comments a little

bit.

Next slide.

So really the consultant's comments kind of fall into a couple of general categories; they're all kind of along these same lines.

The consultant talked about the extent of contamination and the way the Kansas City District shows that in our maps like this one; they talked about the need for additional monitoring and being able to show that the containment system is working effectively.

Their comments talked about a couple of specific perimeters that are important to the model, riverbed conductance and the hydraulic conductivity; those are two important factors that you need to estimate in the model, kind of like Greg described, and the consultant also talked about Johnson, Clear and Silver Creeks.

So with respect to the extent of contamination we've undertaken a couple of different investigation efforts to try to verify how well we're depicting the boundaries of the groundwater contamination, and I'll go to the map, and really what we're talking about is this eastern perimeter.

And the question that the consultant posed

and actually the question that we all have is how well do we know where this line is, is this line really accurate the way it's shown on our maps.

So if you remember from the last RAB we did investigation work in October and November of 2005, where we did a -- we call them transects. We did lines of sampling to try to find where this line is, and the results from first round were actually very good, and the only differences we saw were right in this area here where we would adjust the way that we draw the contamination right down here in a small way in a very small amount.

Everything else, all the other results pointed to the conclusion that this is still a pretty good way to draw the extent of the contamination, so that was the first step.

The second step is more -- more sampling to go back to some of the areas where we weren't able to sample the first time to really kind of fill in the gaps in that line.

That work is already underway, some of you may have had the field crew out on your property last week, but, of course, they had to go home because of the snow, so the plan is to start up again next week as soon as it's dry enough, and

they'll complete that work in -- maybe not by the end of March, it might go into April a little bit, but we'll have those results and we'll be able to show that, you know, either this needs to be adjusted, and we'll document that, or that the way we draw this contamination can stay the way it is.

So the consultant's comments about that are -- it's a fair comment, that's an important piece of information that we all need to know, is where is the contamination, and we've done a lot of work to confirm this, and the results that we've obtained so far are good in the sense that this is still a good picture, it hasn't really changed.

One of the other consultant's comments was need for additional monitoring, and, again, we've talked about this before, the question really is does the Corps have enough monitoring wells in this area to be able to see the effects from the MUD operations when MUD starts pumping.

Are we going to be able to see any sort of deflexion, if contamination were to do something like this would we even be able to see it, and that's a good question, that's a fair question, and, again, that's something that we've already been working on to address.

And based on the results of these investigations that'll be complete in April, we'll decide with EPA and NDEQ where the appropriate locations for new monitoring wells should be.

And right now we have enough funding on contract to pay for almost a hundred new monitoring wells. Most of them are going to go on this eastern side, there's a few that are going to go down here along the south.

We already have a number of monitoring wells along the south, but there's probably some areas where we can use a couple more, so there's going to be a few wells down here that'll be new, and most of them will go in this area here.

The schedule for that right now is to do this investigation sampling in April, get the results, have crops planted, obviously wait for harvest to be completed, and then go back to these areas and install those monitoring wells before the end of the year, this year, before the end of 2006.

So if the wells are in by the end of 2006, according to schedule, we'll be able to sample them all year long during the year 2007, and then in 2008, when MUD starts their operations, we will have already had a year's worth of data prior to them

starting their operations, so we should have a pretty good picture of what's going on in here.

Now, the other thing I want to point out is all of this work is in addition to everything that we already do. Most of you probably live around the area. These green spots on the map here are individual homeowners -- or individual houses rather, that have a well for domestic purposes, so those will continue to be sampled once a year or more frequently if you're in -- if you're one of these along Wanebasin (phonetic) Road.

So, you know, there's a great deal of sampling, there's a great deal of work that goes on on a year-to-year basis to try to confirm where that contamination really is on the map.

The consultant talked about the importance of riverbed conductance and also talked a little bit about hydraulic conductivity in his comments, and those are important perimeters in the model.

They're even more important for MUD especially for the riverbed conductance, but it's important for us as well because we have to be able to do kind of the same simulation; we have to be able to account for what the Platte River is doing during the course of the year.

And we do that with a number of gauging stations that are on the river, we also can -- we rely on historic data, some of which was generated by the City of Lincoln when they installed their wells, so there is some information available about the Platte River that we use in the model.

And it's important for us to continue to study the Platte River and what is happening with the Platte, and in the next version of the model we'll include any new information that's available, either from USGS or from the City of Lincoln or anyone else that has an impact on the Platte River.

We go to them and look for any new information to share so we can use that, and that's something we'll do in the next version of our model.

And then the consultant also talked --

LYNN MOORER: I have a question on something you just had on your previous slide.

I'm looking at your statement here that's saying that the Kansas City District has used the best available information to estimate both of these factors, and I want to ask about hydraulic conductivity.

Have you addressed all the concerns and criticisms raised by Dr. Brian Zurbuchen of DEQ in

his April 13, 2004 letter?

Just as a brief background to ask -- to let you know what I'm talking about, he noted that the hydraulic conductivity assigned in RDGM 4 does not accurately reflect the conditions at the site; and therefore the model predictions of contaminant transport are not reliable.

Among the various things that he noted is that the authors of RDGM 4 have offered conflicting conceptual models of the Todd Volley Aquifer beneath the Mead NOP site.

And he stated, DEQ believes there's overwhelming evidence that the upper zone of the aquifer is less conductive than the lower zone, and these two units must be assigned unique values of hydraulic conductivity in order to achieve the most reliable contaminant transport predictions.

So he specifically said, please, assign representative and distinct hydraulic conductivity values to the upper fine sand unit and the lower sand and gravel unit.

So the first question is: Has this been done? Have you done this in updating your RDGM 4?

JASON LEIBBERT: Well, do you have our response to that comment with you?

LYNN MOORER: I'm asking you what your response is, that's the point of this meeting.

JASON LEIBBERT: I'll tell you my response, I'm just asking if you actually read our response?

LYNN MOORER: I haven't seen it, no, it has not been provided to the public.

JASON LEIBBERT: You don't have the responses to the -- to the regulator's comments?

LYNN MOORER: Mr. Leibbert, that's what we asked you -- we're asking this meeting for, and we ask --

JASON LEIBBERT: It's in the response, we'll get there.

LYNN MOORER: Will you please be so kind as to allow me to just state what I need to and I will not interrupt you.

I'm just following up, asking do you have specific information on this point? If you have handouts that are more specific like, for example, the copy of your responses, those would be welcome.

But you've made the assertion that you've used the best available information. The last documents that we've seen are the concerns raised by Dr. Zurbuchen at DEQ as well as Mr. Marquess at EPA,

so we'd like to know where we are on those various issues that they raised, and the first one hydraulic conductivity.

JASON LEIBBERT: Okay. We'll get to that, there's slides about the regulator's comments, actually it may even be in the next couple of ones. Let's just wrap up Saunders County, and we'll go to the regulator's comments in just a minute.

LYNN MOORER: So are you going to answer my question --

JASON LEIBBERT: I will answer it.

LYNN MOORER: -- in a couple of slides?

Thank you.

JASON LEIBBERT: Next slide.

And here they are. Previous comments from EPA and DEQ about the RDGM model.

So a lot of the comments from EPA and especially Dr. Zurbuchen from NDEQ were on these topics, and hydraulic conductivity is definitely one of the hot-button topics that Dr. Zurbuchen sent us comments about.

And we did respond to all of those comments, and I'm not sure why you don't have those, but I'll get to it, I'll answer the question.

Some of the other comments that we got

from the agencies were to revise the RDGM model to include more of the outside influences, like City of Lincoln and their plans to expand their well fields and some of the other -- other outside influences that weren't previously accounted for in the RDGM model.

The other comments were to use the RDGM model to better estimate the total cleanup time, and we'll talk about that. That's especially hard for anyone to do.

The numerical modeling, the MODFLOW code does an excellent job of predicting where groundwater will go and what direction and how fast, but it's -- it needs -- it has a hard time predicting where contamination will go and how fast it goes, so we'll talk about that one.

Again, hydraulic conductivity is a big one, Dr. Zurbuchen also requested a more detailed sensitivity analysis to be performed on the model, and there was a couple of comments about the irrigation wells and how those were simulated in the RDGM model.

So we'll go through these and we'll get to conductivity.

So, again, the comment was to RDGM 4 isn't

big enough to account for all of the outside influences.

We've agreed to expand the size of RDGM 4, basically goes from this big to this big, but it's -- the objective of that is to include more of the outside influences, and when we do the next version of RDGM this year in 2006, this is something that we'll do so that we can account for -- or better account for City of Lincoln, the Platte West Well Field, other municipalities, the Platte River, some of those other outside influences.

Again, the -- the purpose of the RDGM model is really to help us demonstrate whether or not we have containment with our extraction wells and are we really capturing all of the contaminated groundwater the way we're supposed to.

And that's what the model is good for or does a very good job of doing, is that it does an excellent job of predicting where the groundwater will go and how fast it'll travel and whether or not it'll be captured in our extraction wells.

But we recognize the need to address the total cleanup time. There's a lot of uncertainty about is this project going to require a hundred years or 130 years or 300 years. There's been a

couple of different attempts in the past to try to do this kind of estimate, and again, with -- you know, as Greg kind of described, you know, the model is only as good as the information you put into it.

The groundwater flow part is relatively easy. USGS and other agencies have set the standards that everyone follows on that, that's a relatively easy thing to do, is the groundwater flow portion.

What's hard to do is the cleanup time and how fast or how long is it going to take for us to clean up all of this contamination, and honestly it's going to take a long time. You know, is it 30 years, is it 50 years, is it 100 years; that's kind of the question on the table.

The work that's been done in the past basically arrived at a conclusion of 130 years. We want to try to do better than that. I don't think anybody wants us to be out here 130 years from now still pumping this groundwater.

So the first step is we're going to make some modifications to the RDGM model to allow for these kinds of different simulations to look at the total cleanup time. It's a little bit different than what we've talked about with the RDGM model in

that we'll -- we're going to start doing what Greg kind of described, is the MODFLOW computer programs can do the groundwater flow and directions and velocities.

We're going to have to start piggybacking other programs on top of that to try estimate the total cleanup time; that's something that's in our plan.

URS, our contractor, that performs the modeling is taking the first steps to start that process, and so that's something we're going to work out with the regulators, is try to come up with a best estimate of how long this project is going to take.

So with conductivity, the bottom line simple answer is yes, the RDGM will be revised to account for different hydraulic conductivities.

One of the things that's new since the last time the RDGM model was updated was we now have Extraction Wells 12 and 13 down here that didn't used to be there obviously because they're brand-new, and we have pumping information from those wells that is new information that wasn't available in the previous versions of the RDGM model, so that's one area where we're getting more

information in response to this comment.

The University of Nebraska has some new information for us to use, MUD has pumping information that's new that'll be for us -- new for us to use and for us to include in the model.

So I guess when I say that we're using the best available information to simulate hydraulic conductivities, that's exactly what we're doing, is we're looking at all the possible sources of that information.

It's not just the work that we do, we look for other people doing work in and around this area, and based on what they're doing, if that's -- if we think it's good information and it's something that's going to help the RDGM model be better or do a better job for us, we're going to include that information in the model.

Brian's specific comment about are you going to assign a unique or discrete value to the upper unit and the fine sands and the coarse sands; I'm not the geologist on the project so I can't tell you what those values are going to be, but I can tell you that we're going to use the best available information and the most up-to-date information in the RDGM model.

LYNN MOORER: Mr. Leibbert, could you just clarify for me and for the lady who also asked a similar question, when was your last update of your site model? Is that the RDGM 4, is that the last run of it --

JASON LEIBBERT: Go back.

LYNN MOORER: -- that you would consider a full model or what is your last published site model?

JASON LEIBBERT: The RDGM 4 report was published in 2004. Between 2004 and 2005 we started the design effort for the new extraction system to go down here.

To help us with that design effort, we took the RDGM 4 model, we added some more information into it, we used it very much focused on what was going on down here.

We were -- in 2005 we really weren't looking at other things. We were really focused down here on the Load Line 1, so we made modifications to RDGM 4 to help us with this design, and those modifications and those conclusions and results of all that are published in the Load Line 1 design documents.

And now in 2006, now we're going to go

back and take a whole new look at the whole system. You know, last year in 2005 we were really working down here, now this year is when we expand the model size to include an area that's even larger than this, and that'll be the next update that's coming later this year.

LYNN MOORER: In this 2005 update that you did, did you address and carry out all the directives that Dr. Zurbuchen issued in April of 2004, and that Mr. Marquess issued on behalf of EPA in 2004?

JASON LEIBBERT: Yes.

LYNN MOORER: You did -- you carried out all of their instructions or requests?

JASON LEIBBERT: No, not every single one. We used the ones that made the most sense to help us do this job down here.

About half the comments we have incorporated already into the RDGM model, about the other half of the comments are things that will be incorporated this year because they didn't help us with Load Line 1 design or we didn't have enough new information to satisfy that comment.

Again, those are things that we're going to do this year. We've got all those comments. I

still I don't believe that you really don't have all the responses, but we did respond to every single one of those comments.

LYNN MOORER: I would be happy to have a copy of it if you -- here tonight. If you have a copy to provide me that would be appreciated. I'm sure other people would like to see it.

JASON LEIBBERT: No, I don't have copies to hand out of that tonight, but we can make those available.

But when we responded to all those comments last year, we responded to them either affirmatively that, yes, we agree with this comment and we'll make all these changes, or we responded to, we'll make all those changes but it'll be in the next verse of the model.

LYNN MOORER: Since you have told us that you use your site model to manage the site and for decision making, will a completely updated site model be developed that addresses all the comments and directives from the regulators before the Corps installs the 100 monitoring wells on the eastern and southern portions on the site?

JASON LEIBBERT: Yes, we will have a new model that addresses all those old comments from EPA

and NDEQ. Will it be done before the 100 new monitoring wells go in, no, probably not.

It's -- they're really two independent efforts; they're not hinged on each area. We can make improvements on the RDGM model, we can address all the comments from EPA and DEQ, and we can install the new monitoring wells independently; they're not tied hand in hand.

LYNN MOORER: That does seem to be a major change from what Richard McCollum, a former Army co-chair of the RAB told us in November and in February -- November 2004 and in February 2005.

He said that this is a site model. The RDGM -- your own site model is one that you will use to cite the monitoring wells that you consider to be -- that is he considered to be essential to monitor MUD effectively.

It does seem to be a concern that has been raised at previous meetings, as you may recall, that you do an adequate assessment or an adequate evaluation of the situation here, which includes incorporating all the regulator's concerns and comments before you decide where you need those monitoring wells and at what depths, et cetera.

It doesn't seem to make a lot of sense to

say you're going to install these wells but you don't even have an updated site model that addresses all the regulator's concerns before you start doing that.

JASON LEIBBERT: Well, what we have is the culmination of all of this work up into about this point. We know enough about what's going on over here to know where to put monitoring wells. Those locations are subject to input from the other agencies.

LYNN MOORER: Mr. Marquess, do you agree with that? Do you agree that there's enough information now that's been provided to you and to DEQ to be confident that where those 100 monitoring wells are going to go, you know will be put in the right place or an optimum place to accomplish the purpose?

SCOTT MARQUESS: Well, there is no right answer to develop -- you know, you're not going to have a single right answer about what the monitoring program has to look like or where a well has to be.

So, yes, we can site monitoring wells based on information that's available and in hand. I don't think the need for an updated or revised groundwater model is essential to be able to

adequately site the wells that we -- that are planned at, you know, the end of the year for the southern and eastern boundaries of the plume.

LYNN MOORER: Does DEQ agree with you, do you know?

SCOTT MARQUESS: We have not discussed that.

LYNN MOORER: With DEQ, DEQ has not weighed in on that?

SCOTT MARQUESS: We haven't had any discussions about that in any recent time frame.

LYNN MOORER: Thank you.

JASON LEIBBERT: One of the other big comments from Dr. Zurbuchen was he didn't think that the last RDGM report in 2004 did a good job of documenting the sensitivity analysis, so that's something that we'll do again in 2006, and address Dr. Zurbuchen's comments by doing more of a sensitivity analysis more in the way that he described.

LARRY ANGLE: Larry Angle, Lower Platte, North NRD.

I guess as a case in point, first off on the Saunder's County -- surprised no one here is representing the county tonight, but, anyway, the

Lower Platte North and also the City of Ashland contributed funding for that study.

Our big concern also is a streambed conductance of the Platte River, and is it possible to actually do some sampling and determine some of those perimeters before MUD goes online?

I know in the past the university and USGS has done some of the studies similar to this I believe on the Republican River, and I guess I would like to see maybe some actual data collected in the target area between the MUD well fields, and hopefully get a better answer on streambed conductance.

JASON LEIBBERT: Larry, and you correct me if I'm wrong, you may know more about this than I do, in 1989 there was a riverbed conductance test performed, a real world test, and it was performed by TZA, was the name of the firm or the contractor that did that, and they did it for the City of Lincoln.

And so I can't say that I know what stretch of the Platte River they were looking at, but that's basically the best available real world information that -- for anybody to use, whether it's us or MUD or anyone else who's studying the

groundwater in this area. That is the best record that's available, that's what we used in your work.

SCOTT MARQUESS: Larry, I was just looking back at the MUD -- the Phase 2 model recommendations for the MUD model, that is recommendations for future field data pumping tests to quantify conductance of the riverbed materials near the well field, so that's -- I'm not sure that there's a commitment to do that actually imbedded here, but that was one of the comments I think we had made, so there's like three bullets in terms of the recommendations.

LYNN MOORER: What are you reading from?

SCOTT MARQUESS: I'm sorry, that was Section 8.3.3 of the MUD Phase 2 Model Report, one of their recommendation -- they had three recommendations for future field data.

One was pumping tests to quantify conductance of the riverbed materials near the well field, which is what Mr. Angle's question related to; additional flux target measurements in creeks and rivers, and additional surface water measurement surveys, are what was reported in the MUD report.

GERALD VERDUSKA: Gerald Verduska (phonetic).

Don't spend a lot of time on this because maybe most people in the room know the answer to this question, but I'm trying to understand this Platte River conductance a little better.

Does the MUD model show relative mirroring of the upper level of the aquifer; do the water in those respond to level in the Platte River; in other words, if the Platte River goes up and it go down a couple feet, do those wells, the upper level of the water goes down a couple feet, does it mirror?

And if it does, how about the contaminated area, the plume zone, does that level mirror the wells and the river too?

JASON LEIBBERT: When we talk about riverbed conductance, just for a minute, what we're talking about is if there's a pumping influence outside of the river, like MUD's well fields or anyone else's, the question that the model is trying to answer is when this well pumps, you know, let's just say a lot, when it pumps a lot of water, how much of that water comes out of the river versus how much of that water comes out of the aquifer that that well actually sits in, and the model has a way to estimate that, and it's this conductance factor.

And, again, we have some real world

information available to us to help simulate that in the model, but there's not a great deal of information available, and, again, that's -- as Scott pointed out, that's one of the things that needs to be done in the future is to better estimate that.

So as this well or any one of these wells, as this well pumps, a certain amount of that water comes out of the river and a certain amount of it comes out of the formation.

Well, I shouldn't speak about the MUD model because it's not mine, you know. I can't really tell you what it does or doesn't say about this specific question; I'll just talk in general.

In general, you would think the answer would be yes, that when there's lower flows in the Platte River, whether it's a drought or any -- for whatever reason, if there's a smaller amount of water in the Platte River, that the percentage that comes from the Platte goes down in this well, and this well picks up more water from the aquifer and less from the river.

And vice versa, if the Platte River is very high, whether it a be a flood or whatever it has much more water than normal, it would show up in

this well as well.

GERALD VERDUSKA: So what I'm getting at is from a layperson's point of view maybe it's oversimplification, but if you saw the river go down two feet and within a relatively short amount of time the water in those wells went down two feet, you would probably assume there's a lot of conductance between the two.

JASON LEIBBERT: Right.

GERALD VERDUSKA: And I was just wondering, does the model show that?

JASON LEIBBERT: It -- again, it -- I don't know, because it's not mine, I don't know what it says exactly, but it should -- that should be a true statement the way you described it, is that when the river goes down the water level in here should go down.

The only exception to that would be you may not really see a drop in the water level here because it'll get more from the aquifer to make up the difference.

So the water level in the river may drop dramatically in a short amount of time, but in the well over here the water level may stay steady because more of it is coming from the aquifer and

not from the river.

GERALD VERDUSKA: Well, that's what I was getting at, it seems like that's one of the most important things of the modeling; if you see the plume varying according to the rest of the aquifer in those wells, it shows a great conductance between the whole works.

And like the water level in the plume, what elevation above sea level is that compared to the elevation in the wells, do you know that?

JASON LEIBBERT: Well, I don't have a number. I can't tell you what the elevation is, but --

GERALD VERDUSKA: Seems like that'd be a real important number because you'd know if it's a uniform, if it's connected to the aquifer.

JASON LEIBBERT: Sure, we have water levels for all these wells. I just -- I can't tell you what they are because there's 300 and some odd wells, but you're on the right track in that -- and this is what the Saunders County consultant talked a lot about in his comments, was the reason why this riverbed conductance is so important is if these wells in the Platte West Well Fields, if they get most of their water from the river then that means

they'll have less of an effect on us.

If they're not getting a lot of water from the river, and they're really getting a lot of water from the formation, then that means they'll have a stronger effect on us, and that's why that's an important perimeter, and that's why he had it in his comments, that's why MUD's acknowledged that in their Phase 2 report, you know, that's why there's a need for more work.

GERALD VERDUSKA: Okay. That's all.

JASON LEIBBERT: It is an important concept.

GERALD VERDUSKA: I'm not up on this so much that that just seems like that'd be the very first test you'd do, is just drop a tape down there until you touch the water and see what's in the river, and you know there's a lot of conductance then. That's enough on that. Thanks.

JASON LEIBBERT: And we do do that because there's gauging stations on the river, and as Greg described in the calibration step we get water levels --

GARTH ANDERSON: Your mike is off.

JASON LEIBBERT: Okay.

So we do that; we take water level

measurements from all the wells, we drop the tape down there and we get the water level. We do that and compare it to measurements from the river, from the gauging stations at the same time on the same days.

We also compare that, there's gauging stations on Johnson Creek, there's -- I can't remember if there's a gauging station on Silver Creek, I think there's one on Wahoo Creek.

So all those -- all those measurements all at the same time are important for that exact reason, you're exactly correct.

Another comment from --

GARTH ANDERSON: Let's go with old reliable here.

JASON LEIBBERT: The number of irrigation wells and the way they're simulated in the model is also an important factor, and the reason is pretty obvious.

There's a number of irrigation wells in this area, and they all pump at different times of the year and they all pump at different rates, and they're important because they're taking water out of the aquifer, and it effects how well our extraction wells do their job.

So a lot of the comments from Dr. Zurbuchen were to do a better job in the RDGM model of simulating those irrigation wells.

The short answer is is that in the next version of the model, when we grow the model because we're going to expand it in size and make it bigger than it is now, we're going to need to go back and find all those irrigation wells in the new areas that we didn't previously have in the RDGM model.

The way we do that is we can get that information from the state registered well database, we can get that kind of information from the university. There are some resources available to get that kind of information, and that's what we'll use and we'll -- again, we'll try to use the best available information.

LYNN MOORER: Do you -- can you tell us roughly for a sense of comparison in your RDGM 4, roughly how many irrigation wells did you use on that one, and then did you add more when you did your partial update in 2005?

JASON LEIBBERT: You know, no, I don't know the number of irrigation wells.

LYNN MOORER: Do you have a rough idea of what the total pumpage was and for how many months?

JASON LEIBBERT: Without looking at it I think, you know, when we simulate it, we pump them for two or three months out of the year just like a normal irrigation season would be, and the total combined pumpage again, I don't know the number off the top of my head without looking it up.

LYNN MOORER: I've got your report here.

JASON LEIBBERT: Okay.

LYNN MOORER: I'm interested in you telling us some of these specifics, because I know that this discussion on irrigation wells is going to be something we want to go into in more detail on MUD's models, okay, so we would appreciate having this comparison. These irrigation well issues are big.

JASON LEIBBERT: I don't have that report. If I could borrow it I could find how many wells are in there.

LYNN MOORER: You may borrow it.

JASON LEIBBERT: Is that the whole thing?

LYNN MOORER: As far as I know. I mean, I don't have your things on disks there, but --

JASON LEIBBERT: Well, this is probably going to take a few minutes. Someone will have to find the table or find the figure that's got the

number of wells posted on it. It's not immediately available to me. Scott's got it.

SCOTT MARQUESS: Let's not wait on Scott now.

LYNN MOORER: Right. Go ahead.

JASON LEIBBERT: Okay. Next slide.

So here we are on the MUD --

LYNN MOORER: Mr. Leibbert, excuse me, could I ask a couple of questions more generally about your model before we move on to MUD's model?

JASON LEIBBERT: Sure.

LYNN MOORER: All right. At the February 22nd, 2005, RAB meeting, Richard McCollum stated, people who are expert in the field have reviewed our site model and have determined it to be adequate.

I'm wondering who are the people who are expert in the field who have reviewed it and determined it to be adequate?

JASON LEIBBERT: Well, I can tell you all the reviewers, but I can't tell you their opinion, whether or not it's adequate, but Dr. Brian Zurbuchen reviewed it, EPA reviewed it, the Corps of Engineers Center of Expertise for Hazardous and Intoxicate Waste reviewed it, and I think that's it

during the development.

LYNN MOORER: My question is specific; that is, who is the -- who are -- is or are these experts that Mr. McCollum was referring to who have deemed it to be adequate?

Clearly I would think a fair characterization of Dr. Zurbucken's comment is that he did not find it adequate, nor did Mr. Marquess's comments in April of 2004 find them adequate, so what expert in the field is the one that Mr. McCollum is saying has found your site model to be adequate?

JASON LEIBBERT: Yeah, I don't have an answer for that, I don't know.

LYNN MOORER: All right. Will you please follow up on that, and so then as part of that would you then determine when were -- tell us when these reviews occurred and where these reviews were published --

JASON LEIBBERT: Well --

LYNN MOORER: -- the ones that found your site model to be adequate as of February 22nd, 2005?

JASON LEIBBERT: Well, you've got a lot of the comments from DEQ and EPA.

LYNN MOORER: I don't mean to belabor the

point, I'm just saying he said somebody has found your site model to be adequate; everything that we have seen from the regulators that we know of here have said it's not adequate.

So we're interested in knowing who he was meaning when he said experts in the field have found our site model to be adequate.

JASON LEIBBERT: The model is adequate; however, the model can be improved in ways, and, again, this is what we talk about, this is what Greg talked about, modeling is an iterative process.

There is no stopping point in the process, there is no end point where you say this model is adequate or this model is not adequate.

You go through this continuous improvement process and you look at the model, you collect measurements from the real world, you take real world water level datas, you take real precipitation rates, you take real irrigation pumping rates, and you put that into the model and you see how good a job the model does in matching those.

So it's -- you know, is the model adequate or not, yes the model is adequate. Do we need -- is there more work to be done on the model, yes, there's more work to be done on the model.

Every year when we get new information it's our job to put that back into the model and verify if the model is still doing a good job or not. It's this cycle of continuous improvement there is never really a stopping point for the model.

LYNN MOORER: I have one more follow-up question, and then I'll leave this one alone for now.

Mr. McCollum also stated at that February 22nd, 2005, RAB meeting, he said, there's a possibility of having further peer review of it just to make certain we haven't missed something.

We talked about the possibility of asking the USGS, perhaps in a location you know, kind of not here, you know, that hasn't been involved; in other words, to get some totally fresh eyes on it.

We're looking at that because we do hear your concerns. We want to make sure we have as good a model as we can. So that's the end of the quote from Mr. McCollum.

Whose totally fresh eyes has the Corps gotten to review its site model?

JASON LEIBBERT: We have not gone for any sort of outside peer review other than the EPA and NDEQ

at this point.

LYNN MOORER: Thank you.

WANDA BLASNITZ: I guess I was wondering because you had said that this is a numerical model, and Mr. Steele had indicated that the analytical model is a better model, and I think you said too that numerical models are not that good at predicting where the contaminant will go and how fast it will go, so have you thought about going to an analytical model?

JASON LEIBBERT: I may enlist Greg to help me.

Greg also described the analytical modeling in that it's very simplistic, and the only way you can get the analytical model to work is by making a number of assumptions that decrease the complexity of the problem you're trying to model.

Their -- analytical models are better in the sense that they can be easier to use and they can be more simple and it doesn't require as much work, but analytical models have -- they're only capable of doing certain things, and for a site that's this large and this complicated, we have to go above and beyond what the analytical models can do, and that's what the computer numerical modeling

does, is --

You know, Greg had a number of different equations, and if you're doing a very simple problem maybe you only need to do that equation once, but if you're doing a problem like this, you need to do that same equation hundreds of thousands of times, and that's what the computer does, is automates all those equations and arrives at a numerical solution that way.

It's -- I'm not so sure it's a case of one is better than the other; it's that analytical models have their place and are good for some things but not everything.

Numerical models have their place and they're good for some things, but they're not good for everything, and we're in the situation that we need a numerical model, a computer model to do something that's as complicated as this, so that's the first part.

The second part about -- the model has a hard time predicting the total cleanup time, and it really goes to what mechanisms govern the spread of contamination, and based on the operational history of the site, based on the information that we get from our sampling, you know, you can say that

contamination was released up here, and then over the course of 40 or 50 years it's traveled in this direction.

The groundwater model, the RDGM 4, which is a numerical model, does a very good job of predicting this direction, and it does a very good job of predicting how fast it's going to get there.

But what it doesn't yet take into account is all the other mechanisms that affect the contamination, and probably the easiest way to describe this is a contaminant like TCE, is -- it's an organic compound, and it likes to attract or stick to other organic things in the aquifer.

So soil has a lot of natural organic material in it, that's what makes it good for agricultural purposes because it has a lot of organics.

The TCE will -- when it's in the groundwater and it's moving through the aquifer, it likes to grab ahold of those other organic materials in the soil and just kind of stays there.

The water continues to move, but the TCE gets hung up and doesn't move as fast as the water does, and that's -- that's kind of an oversimplification. That's another -- another

aspect of the model, and Greg had this in his slide when he talked about you kind of start with the MODFLOW code and you do your hydraulic, you do your groundwater model for flow and directions and velocities and things.

And then the next step is you go kind of above and beyond that, and you do contaminant transport, you do -- I can't remember what else Greg had in his slide, heat and surface flow and other things.

Those are kind of the next level. You know, after you -- you've done your groundwater model, you go to the next step and you do contaminant fate and transport models.

We've done that in the past --

VIDEOGRAPHER: I need to change my tape.

GARTH ANDERSON: Sure. Actually since we've been at it for two hours this might be a good chance to take a quick break.

(Off the record.)

JASON LEIBBERT: Everybody ready?

Before we talk about MUD, just -- we were talking about analytical versus numerical modeling, and Greg had a clarification that he wanted to make.

GREG STEELE: Yes, you had mentioned that

I had said that analytical models were better than numerical models, and it really depends on the situation.

The analytical models are very useful tools, but it's the situation that you need. They're really good for the simplistic aquifers, but as far as better than numerical models, that's not the case at all.

JASON LEIBBERT: Okay.

JOHN KNAPP: And the question is pretty general. If you make an assumption, for instance you're talking about the well -- the irrigation wells, and so, I mean, in the real world the water is going someplace, and if you've made a mistake in your -- say, for instance, you assume the wells pump at their rated capacity when they were drilled and they're only being pumped, say, actually at 60 percent or something like that, how does this get squared away on a model as -- and not -- you know, you're -- this water -- you're picking up this water someplace else, and so how do you get these things back in the same --

JASON LEIBBERT: Okay. That's a good question.

Greg had it on one of his slides. It's

called the water balance, and the question is exactly the way you posed it; where does the water go and where does it come from?

Water comes from the up gradient direction at -- here at this site it basically moves in this direction, so water that's down here today used to be up here at some point in the past, so water flows this direction.

Water also comes from precipitation, and then the other way water gets into the formation is through irrigation, you know, you irrigate, you pump water out of the ground, you spray it back onto the ground, and a certain percentage of that water percolates down into the ground; some of it evaporates, some of it percolates down.

We're never going to know the exact pumping rate for every single irrigation well because every person out here that -- that farms and has an irrigation well does it according to his or her schedule.

You know, we don't know how much they pump when they pump them, we don't know how often they turn them on. We know in general, you know, they're a three-day on/five-day off cycle or some other cycle that each individual farmer, you know, decides

himself.

But what we can do is we can make some estimates. You know, in general, we know what the average is; three days on/five days off for an average of two months out of the year or maybe two and a half months out of the year.

The flow rate is a little trickier to estimate because somebody may put their irrigation well at a thousand gallons per minute, and someone else may pump their irrigation well at only 200 gallons a minute, and where's the average in between that, sometimes that's hard to determine when there's -- when there's so many irrigation wells.

So the way we do that is we -- we make our estimate and we put that into the model and then we run the model, then see what kind of predictions it makes, and then as Greg described, it's called the calibration process, the model tells us -- the model basically says I think the water level at this location should be, you know, 57.8 feet above sea level, and we go out and we actually collect a measurement, and it's 59 feet above sea level, so it's different by a small amount.

Some amount of difference is acceptable as

long as it's very small and it's very -- it's very orderly. As long as there's no random fluctuations that go all over the place, some amount of difference is okay.

And there is kind of a -- there are some limits that -- you know, the academic and the modeling community have defined for what -- what is and is not an acceptable range.

You know, all the work we try to do we -- we work with the model and we try to collect enough information from the real world to try to make that difference as small as we can get it.

Is it a hundred percent perfect match for every single well out here, no, it's not going to be a hundred percent perfect match, but it is going to be within the acceptable limits, and if it's not, that means we have more work to do, and we need to go through that process again and take more measurements and refine the model to make it better.

So it's kind of an ongoing, continuous process that you're also trying to get closer, you're trying to make that difference as small as it can be.

One of the other things to talk about tonight is the MUD's 2004/2005 model.

LYNN MOORER: Did you have -- before you move on to that, did you have an -- the answer for me then on the irrigation wells on the RDGM 4, both the number and the rate or the pumpage?

JASON LEIBBERT: Did you get your document?

LYNN MOORER: Yes, I did, so what's the answer?

JASON LEIBBERT: Well, I think Table 4-1 shows that there's 57 supply wells in the modeled area.

LYNN MOORER: Fifty-seven.

JASON LEIBBERT: And it has an approximate rate for each one of them, and the combined total is not shown. So you can add them all up. Table 4-1 has all the pumping rates for those wells.

LYNN MOORER: So you only looked at 57 irrigation wells for your RDGM 4 --

JASON LEIBBERT: Yes.

LYNN MOORER: -- is that accurate?

JASON LEIBBERT: And the reason is --

LYNN MOORER: My goodness.

JASON LEIBBERT: -- because the RDGM model is very small and it's really only focused on this site in our extraction system. We're not trying to

model all of Saunders County, we're not trying to model everything that MUD is trying to do in their model.

You know, you probably know MUD has hundreds, and there's some controversy about how well they describe that in their document, the number of irrigation wells that they have in there, but they have hundreds because their model is probably ten times the size of our model.

When we do the next version this year, 2006, again, all the comments from DEQ and EPA, we're to make the RDGM model bigger to include more of these things, and that's what we're going to do, that's actually already started.

LYNN MOORER: So when specifically are you going to produce the update of the RDGM this year, precisely when, like what month?

JASON LEIBBERT: I think -- I'd have to check, I think the schedule says that we give a document to EPA in September of this year.

LYNN MOORER: And it'll be published at that time? What's the cutoff for the data then that you're going to be plugging into that? What is the cutoff for the data that you will be plugging into that?

JASON LEIBBERT: Well, I'm not sure there's a date. I think what you're asking is is there -- is there like a time cutoff whereas of this date we don't have any more new information?

LYNN MOORER: Well, let me rephrase it: What would be the last possible date at -- in which or at which -- on which you could plug in more updated information in order to come up with your September RDGM 5, is that what you would call it?

JASON LEIBBERT: Yeah, actually -- well, RDGM 5 or RDGM 2006 or --

LYNN MOORER: Anyway --

JASON LEIBBERT: -- Groundwater Model 2006, I'm not sure what we'll call it.

LYNN MOORER: What would the cutoff date be --

JASON LEIBBERT: The cutoff date --

LYNN MOORER: -- for that?

JASON LEIBBERT: -- I think to try to answer the intent of the question, I think for this March and this April we're doing all this investigation work here, and part of that is to collect water levels from all of the monitoring wells, and that -- we do that ourselves. We coordinate that with the NRD because they have a

number of wells in their area that they take measurements at.

I can't remember if USGS does that, so us, NRD, USGS, MUD is probably going to take water levels from their wells.

LARRY ANGLE: City of Lincoln.

JASON LEIBBERT: City of Lincoln.

LARRY ANGLE: And the university also has a couple.

JASON LEIBBERT: Right, the university, so all those combined, we basically work together to take all those measurements hopefully within a couple days of each other. Basically the same week in -- are we going to do that in March?

LARRY ANGLE: Yeah, we're doing it next Wednesday.

JASON LEIBBERT: So next Wednesday we'll get water levels from all these wells in the whole area. It -- that is going to be the calibration target that URS is going to use in this new version of the RDGM model.

They're going to -- and when we talk about calibration, basically we -- you know, next Wednesday we're going to take water level measurements from all these wells, and then URS is

going to use that as their calibration target for the model.

So they're going to run the model with new conductivity information and new riverbed estimates and those kinds of things to see if it can match those water levels that we collect on next Wednesday.

So in a sense, maybe that's the cutoff time that you're thinking of. You know, we have new information from last year, new information from 2004 that hasn't been incorporated, so it's basically everything up to this point, and the water level survey next week is one of the key calibration targets that'll be used.

So between March and September is when URS and we kind of, you know, go to the computer and do the work and write the report and, you know, we review the report internally before we submit it to anyone else, and those kinds of things, so --

LYNN MOORER: Would you walk us through the MUD model, 2004 model now, each of your comments for that --

JASON LEIBBERT: Well --

LYNN MOORER: -- and then walk us through the 2005 model comments that the Kansas City Corps

had --

JASON LEIBBERT: Well, I didn't --

LYNN MOORER: -- specifically?

JASON LEIBBERT: Not really going to do that. What we've got here is the '04 and '05 model, you know, we reviewed both of those and we submitted comments on both of those, and basically all of the Corps comments fall into these general topics.

And this slide and the next slide, these are the comments or these are the questions that we asked MUD either last year for the 2004 version of the model, you know, and then again recently this year for the 2005 version of the model.

We asked them to evaluate pumping rates higher than the permitted average allowed by the permits, to evaluate those scenarios. We asked them to do a different or a better calibration of the model; we have a couple comments about that.

We had a couple comments about -- similar to what we've been talking about, asked them to go back and use new information or other data that's available when they estimate things like riverbed conductance or hydraulic conductivity.

MELISSA KONECKY: But some of these concerns from 2004 are still different from the

concerns of the 2005 update, and we were under the impression that the purpose of this meeting was to go through each one of them separately --

JASON LEIBBERT: Well --

MELISSA KONECKY: -- as opposed to lumping these two together.

LYNN MOORER: Mr. Leibbert, that's the whole point of this meeting is to be able to talk about this in detail, comprehensively. We'd like to go --

GARTH ANDERSON: Well, your original -- this is Garth Anderson.

Your original letter did just request it to offer our opinion of the MUD model.

LYNN MOORER: Yeah, we want your view -- we wanted your view of the 2004 model --

GARTH ANDERSON: Which you will get.

LYNN MOORER: -- and each of the comments for the 2005 model.

GARTH ANDERSON: We're not going to walk through comment by comment. We're going to talk in general the results of our review from the 2004 as -- and as it leads into 2005.

LYNN MOORER: Why not? We -- that's the purpose of this special meeting, to be able focus --

you have been giving us basically the bum's rush every time we ask for detailed questions at regular RAB meetings saying we don't have time, we're not prepared.

That was the main point of this meeting, we could finally get some detailed answers to questions that have been outstanding for a long time.

GARTH ANDERSON: We're prepared to answer your specific questions; we just did not intend to walk through comment by comment the reviews of 2004 and 2005 models.

LYNN MOORER: Well, that's a specific question we're asking you. It doesn't take a long time if you say, okay, we pointed this out, and this is the concern and this is why, we pointed this out, this is a concern and this is why; just -- if you just go ahead and roll with it I think we could get that covered without a lot of problems here.

JASON LEIBBERT: Well, they're all right here. We asked them to evaluate pumping rates higher than the average permitted rate because we were interested in seeing the effects of higher pumping rates to see if that would a negative effect on the Mead plume.

We asked them to do a better calibration of the model because there was some questions about how they did that the first time around, and it has to do with the transmissivity and the sensitivity analysis. This is all spelled out in the comments.

LYNN MOORER: That's what we want you to talk about, Mr. Leibbert.

JASON LEIBBERT: I can read them to you. Would you like me to read them?

LYNN MOORER: Not everybody has all this stuff, that's the point of it. We want everybody to hear.

JASON LEIBBERT: But if you have them then everyone should have them.

LYNN MOORER: That is not fair nor is it correct, Mr. Leibbert, you know that. This is a public meeting, you're to provide information to everybody who attends.

MELISSA KONECKY: Not everybody here can open an attachment, not everyone here is internet connected. You know, I'll forward all this stuff to these folks and they can't always open them, they can't always print them. I mean, some of them aren't even online.

GARTH ANDERSON: If I recall from one of

your request letters that you said that no need to provide the information from MUD because you already had those comments and responses available.

LYNN MOORER: That's not true, we --

GARTH ANDERSON: Would you care to clarify, please?

LYNN MOORER: To clarify, we asked you specifically to provide copies, hard copies for people to look at for this meeting as handouts that would supplement the oral or the verbal presentation that you would make.

And we said because the MUD model was online, both of them are online, and they contain your written comments from last year, there was no need to provide that to us again as a handout prior to the meeting.

But that in no way gave you permission to not talk about this stuff in detail now at this meeting.

GARTH ANDERSON: We're prepared to talk in detail.

LYNN MOORER: All right. Go for it.

GARTH ANDERSON: Thank you. And bear with us as we read through the comments and responses, and also keep in mind that there are no responses

from MUD on the review of the 2005 model yet.

LYNN MOORER: Okay. They had -- they had mentioned that mid March they would have them, so they don't have them yet, right?

JASON LEIBBERT: I don't believe they've published anything yet. Well, I'll just say it one more time because it's a true statement, I think, somebody correct me if I'm wrong, the MUD web site has all the comments from the Corps, all the comments from EPA, all the comments from public reviewers, and they also have all their responses to -- those aren't on the web site?

LYNN MOORER: Only with respect to the 2004 model, Mr. Leibbert.

JASON LEIBBERT: Well --

LYNN MOORER: That's not up there for the 2005 model, but again, Ms. Konecky said, not everybody has access to a computer or likes to use a computer or likes to use the internet, okay.

That's one of the reasons why we asked for this special meeting, so please, would you just get on with it. We would appreciate -- explain to us -- you can just move quickly, this is our comment on the 2004 model, 1, 2, 3, 4, 5; this is what they did to respond to it, we found this acceptable, we

didn't; and this is what changed in 2005, whatever they are.

We'd like to know what your thoughts are and explain to us what -- why you had concerns in 2004, and the ones that were addressed and the ones that weren't adequately to your satisfaction.

We've asked you these questions at previous RAB meetings, you may recall in February 2005, Mr. Leibbert.

JASON LEIBBERT: I remember, and that's --

LYNN MOORER: All right. So now is your opportunity to fill us in in detail.

JASON LEIBBERT: That's what these slides speak to. These are the comments that we gave to MUD, this and the next page, and we can talk about those.

LYNN MOORER: There are seven pages here.

JASON LEIBBERT: Seven pages of what?

LYNN MOORER: Your documents covered seven pages for the 2004 model.

JASON LEIBBERT: And they're --

LYNN MOORER: That's a lot from what you've got here.

JASON LEIBBERT: They're summarized right here.

Comment No. 1, this report includes discussion of two different modeling scenarios: A steady state scenario that utilizes a total Platte west well field pumping rate of approximately 52 million gallons per day, and a transient scenario that utilizes a variable pump rate that ranges from 40 to 75 million gallons per day over the course of one year.

While these two scenarios are reasonable, NWK, Kansas City District, expects that these scenarios will not be satisfactory to the contingent of public and regulatory reviewers.

Kansas City District has received numerous comments from the public EPA and NDEQ asking for more modeling to address questions such as what if MUD pumps 75 million gallons per day, does that impact the NOP plume; how long can pumping operations continue at rates higher than 52 million gallons per day before there's an impact on the NOP plume; what about 104 million gallons per day.

Kansas City District requests that this report be revised to include additional pumping scenarios to address the question of at what point does the pumping impact the NOP plume.

MIKE RYAN: I have question after you

address the first comment.

JASON LEIBBERT: So that's the first comment here, evaluate average pumping rates higher than the permanent rate, that's what we asked them to do our in our Comment No. 1; and their response was that they would do simulations at higher pumping rates, which is what's in the Phase 2 report.

LYNN MOORER: Are you satisfied then with what they did in the -- in the 2005 model on that issue?

JASON LEIBBERT: We've provided comments to them on the '05 model, and we have no further comment on this question.

MIKE RYAN: We have a question over here.

LYNN MOORER: So the question is are you satisfied, yes or no?

JASON LEIBBERT: Yes, we're satisfied.

LYNN MOORER: All right. That's what we wanted to know.

LORUS LUETKENHAUS: When they're permitted to pump 104 million gallons a day why would you even consider letting them only give you information for a water model that's 70 million gallons a day?

JASON LEIBBERT: Well, we need to be more specific. They're not allowed to pump at

104 million gallons per day uncontrolled. There's an annual average rate of 52 million gallons per day, that that's what the permit is meant to enforce.

And the model -- the '05 -- the '04 and '05 modeling report did look at pumping rates higher than the 52 MGD permitted rate.

LORUS LUETKENHAUS: I think if you read the 404 permit it says they can pump at 104 gallons a day.

Now, you're right, the average pumping rate will be 52 million gallons a day to fulfill their maximum pumping, but they can pump at 104 million gallons a day for however many days they want to pump.

JASON LEIBBERT: As long as they --

LORUS LUETKENHAUS: They don't exceed the maximum pumping --

JASON LEIBBERT: -- the annual average, right.

LORUS LUETKENHAUS: Yes.

JASON LEIBBERT: And that's -- well, I'm treading into the area of trying to explain the MUD model, which is really not my role. You know, we didn't make the MUD model.

If there's questions about the MUD model, those questions really should be directed to MUD about what they did in their model.

But this is a pretty easy one, I can tell you that everybody knows that during the summer they're going to have to pump more than 52 MGD to fulfill the demands, and then during the off-peek seasons, during the wintertime, they'll have to pump less than 52 MGD so that by the end of the year their annual average is only 52 MGD.

GARTH ANDERSON: Okay. Let's go on.

JASON LEIBBERT: So the second comment from us, from Kansas City District, on the 2004 model was -- has to do with calibration and aquifer transmissivity, hydraulic conductivities, sensitivity analysis; it's very similar to what we talked about in regards to the DEQ comments on our RDGM model.

The '04 model had -- they -- they did their calibration process, they did their sensitivity analysis; we had some questions about that, specifically aquifer transmissivity and how that parameter was varied during the sensitivity analysis.

And we basically agreed with their

response. They did some additional work and provided some additional justification that last year we were basically satisfied with.

Comment No. 3 from us to MUD on the 2004 model was the 2004 model wasn't using the most current operational data from our extraction wells from the City of Lincoln wells, and we asked them to correct that, and they provided some additional information.

We gave them our actual operating rates from our extraction wells so that they could use those, and I think the only question that still remains on that is how they're modeling the City of Lincoln well fields I think.

You guys had that in your comments again on the 2005. The City of Lincoln talks about expanding their well fields, how does MUD's model account for that future expansion.

So that's one area of the model where they still need some work; we basically shared that same comment with you guys on that.

LYNN MOORER: Mr. Leibbert, just if -- it's possible that people are not clearly just to say they need some more work on it; is it not accurate to say that for the second year in a row

MUD did not use actual pumping rates for the City of Lincoln?

They did not use accurate pumping rates for the City of Lincoln in this second model; that is their 2005 model, so much of the same -- many of the same deficiencies were repeated in the second model with respect to the City of Lincoln pumping rates.

JASON LEIBBERT: With respect to the City of Lincoln pumping rates, what they have in the model probably needs to be corrected.

LYNN MOORER: (Inaudible comment.)

SCOTT MARQUESS: I'll answer it.

I believe on -- we had a similar comment.

I think the issue in the second model was that it wasn't the current use, it was a projected future use, which is reported on Lincoln's web site.

The City of Lincoln has a web site that has some master planning, and so I'd like -- our comment was to the effect that you need to consider the projected future water use, needs, whatever of the City of Lincoln as outlined in their master plan, which I don't think they did in the second model. Does that --

JASON LEIBBERT: (Nods head.)

LYNN MOORER: The report comments are different than that.

COURT REPORTER: I'm sorry, what did you say?

GARTH ANDERSON: Thanks.

LORUS LUETKENHAUS: Lorus Luetkenhaus again.

On MUD's second model did they use any information from the 1997, information that they used for the first model, did that make sense?

Did they use any of the same information on this second model that they used on the first model?

JASON LEIBBERT: I'm still not tracking with you, data with --

LORUS LUETKENHAUS: Well, one would be the Lincoln water system, of their usage. I mean, they estimated it for the first model; did they estimate for the second model?

JASON LEIBBERT: Well, I think it's similar to Lynn's question is are they using actual pumping rates from the City of Lincoln.

LORUS LUETKENHAUS: Right.

JASON LEIBBERT: And I think the answer is no, they're probably not using actual pumping rates;

they're using something else that they've got from another source, which was kind of their future expansion. That's something that can be changed the next time they do the modeling.

LORUS LUETKENHAUS: Okay. Now I've got a second question.

On the 404 permit, No. 60C, permittee -- solely at permittee cost will provide a base line transient groundwater model using the most current data available.

So they did not do that, correct, just by what you said?

JASON LEIBBERT: Go on.

LORUS LUETKENHAUS: So they're in violation -- technically they're in violation of the 404 permit?

GARTH ANDERSON: Okay. We're not prepared to talk about specifics of the permit tonight. I will refer you to the MUD web site, which posts its current permit status, and that's been vetted by the Corps of Engineers, the permit conditions and the status.

So the only -- the bottom line is on the permit that us and Omaha are in concert with is that the -- that MUD will be in full compliance with the

permit before they begin operations.

It's not a, you know, in violation at a particular time, but by the time they are ready for full scale operations they'll be in compliance with the permit.

That's all I'm going to say about specifics of the permit tonight.

LYNN MOORER: Just a -- I appreciate your explanation, Mr. Anderson. Would you explain what you mean by vetted? Was this -- the status list composed by MUD and then Omaha District signed off on it or was it an Omaha District generated project?

GARTH ANDERSON: The status is written by the MUD and it's reviewed by Omaha District before it's posted on the MUD web site.

LYNN MOORER: So that's critical to know it's an MUD document.

GARTH ANDERSON: Which is reviewed and blessed by the Omaha District before it's posted on the web site.

LYNN MOORER: Thank you.

JASON LEIBBERT: The fourth comment that we gave to MUD on the 2004 model had to do with the single layer nature of the MUD model and the ability of the model to simulate groundwater flow under

Johnson Creek.

And the way this was evaluated and redone in the 2005 model was for them to place particles in the vertical direction, and then subsequently show, you know -- the document shows that those particles are capable of moving under Johnson Creek and other creeks in the area, and that those creeks only partially prevent groundwater flow from one direction to another. So we're basically satisfied with that.

The fifth comment that we gave to MUD on the --

LYNN MOORER: I'm sorry, I just didn't hear the end of what you said. You said you're basically satisfied with what MUD said in their 2005 model regarding Johnson Creek and the flow?

JASON LEIBBERT: Regarding the ability of the model to simulate vertical flow directions, yes, we're satisfied with that.

The fifth comment we gave to MUD on the 2004 report has to do with the value assigned to storativity for different areas within the model.

And the resolution on that was that they would use values for storativity that were

consistent with the Platte valley, and that we're basically satisfied with that as well.

The sixth comment that we gave to MUD on the 2004 report has to do with the recharge rate, which means how much precipitation happens during the course of a year and how much of that rain water actually percolates down into the ground versus how much leaves the site on -- in a creek or in a river, how much of that water evaporates out.

And we had a question about how they estimated that recharge, and they provided an explanation that we were basically satisfied with.

LYNN MOORER: Excuse me, Lynn Moorer.

Mr. Leibbert, do you have a document that shows the resolution of each of these? Mr. McCollum mentioned to us at the February 2005 meeting normally when we resolve comments there's some statement as to what the resolution is.

So is there some document that is -- that we could look or that you could provide us that shows what the resolution of all of your comments were on the 2004 model?

JASON LEIBBERT: I'm reading from the responses that MUD wrote to all these comments, and then giving the Kansas City position on those.

LYNN MOORER: So you're looking at MUD's version of it to say that's the resolution of the Kansas City Corps' comments?

JASON LEIBBERT: No, that's not what I said.

LYNN MOORER: What -- so it's an MUD document you're looking at, correct?

JASON LEIBBERT: MUD provided a written response to every comment that we gave them, and that's what I'm reading to you right now.

LYNN MOORER: And so that's what you consider to be the document that records what the resolution of all those issues were?

JASON LEIBBERT: It records the response to all of our comments.

LYNN MOORER: All you need to do is answer yes or no. I'm asking: That's the document you regard as being the --

JASON LEIBBERT: This is a document that I regard as being --

LYNN MOORER: -- that memorializes the resolution?

JASON LEIBBERT: Memorializes the responsive comments, yes.

LYNN MOORER: The question is: But

memorializes the resolution of the comments that the Kansas City Corps had on the 2004 model?

This is an MUD document; are you basically adopting this MUD document as your own and saying, yes, this is our document that memorializes the resolution of all of our issues with them?

JASON LEIBBERT: No, I'm not adopting this document at all. I'm reading to you what -- how MUD responded to all of our comments, and then I'm giving you the Kansas City District's response, so our resolution or acceptance or opinion, if you will; that's what you asked for, isn't it?

LYNN MOORER: My basic question was: Is there a Kansas City Corps document that memorializes what the resolution is, as Mr. McCollum says you normally do whenever you have resolution of comments?

JASON LEIBBERT: No, there's nothing -- there is no memorializing document the way you're describing it, no.

I have all the responses that MUD wrote and I have all the comments that we gave them on the 2005 model, and pretty soon we'll have responses to those comments as well.

And you asked for the Kansas City opinion

on those responses, and that's what we're talking about here, this is what I'm reading to you.

MIKE RYAN: I'm going to go back to Lorus' question, which I don't think you really answered in a very clear way.

You were talking about you're only requiring MUD to work their model assuming a 70 million-gallon a day pumping rate; is that correct?

JASON LEIBBERT: No, not exactly. We're not requiring them to do 70 or 75 or 72 or 83; there's no requirement like that, no.

MIKE RYAN: You're suggesting it?

JASON LEIBBERT: Well, we asked them to evaluate what would happen in this -- what would happen to this site, what would happen to this project, what would happen if you did pumping rates higher than 52 million gallons per day for longer than just a couple months out of the year, because we know they're going to go above 52 MGDs at certain points of the year.

So what if, it's kind of a pretend question, it's something --

MIKE RYAN: Well, it's really not pretend because you know they're going to do 104 at some

time probably.

JASON LEIBBERT: We don't know that.

MIKE RYAN: Oh, I think eventually they will. They wouldn't spend the money for those kinds of pumps if they weren't going to use them.

JASON LEIBBERT: We asked them to do some of these what-if scenarios, and they did that in the 2005 version of the model.

MIKE RYAN: And how high did it go?

JASON LEIBBERT: They went up to 104.

MIKE RYAN: They did use 104?

JASON LEIBBERT: And I think it was 5 MGD increments; they started at 52 and I think they went 5 and then 5 more, so probably 57, 62, 67. I think they did it in 5 to try to demonstrate or try to illustrate rather what would happen at all those different steps, at 57, at 62, at 67, and their conclusions are in those -- in their report.

I mean, that's -- I think that's a fair characterization of what they did in their report.

MIKE RYAN: Okay. Thank you.

SCOTT MARQUESS: I'm not sure if they did 5 MGD increments, but they went to 104.

HAROLD KOLB: For how long?

SCOTT MARQUESS: MUD's model has 104 MGD

scenario under steady state, and they did what they called particle tracking, where they placed a particle east of where the plume boundary was alleged to be, and saw that how that behaved.

I don't have a problem with their depiction of the plume boundary, and what they did was I think the particle tracking was -- the particle started at a half mile east of the plume.

NEW SPEAKER: (Inaudible comment.)

SCOTT MARQUESS: I believe that's correct.

JASON LEIBBERT: The seventh comment that we gave to MUD back in 2004 has to do with the way the agricultural grain tiles were simulated in the model, and they provided more information.

They did -- they did some field surveys to try to verify where drain tiles actually exist, and we were basically satisfied with that response.

LYNN MOORER: They tried to?

JASON LEIBBERT: Well, they did do field surveys and they did gather actual information, actual locations about where the drain tiles are, and they changed the way they simulated them in the model.

The eighth comment that we gave them back in 2004 had to do with the transient simulation

versus the steady state simulations, and we asked them to run a transient simulation that was longer than two years in duration, and to illustrate that the conclusions from the transient simulations were consistent with the conclusions from this steady state simulation.

And they basically did that. They did transient simulations that were a little bit longer than two years, and demonstrated that there's no significant differences between the conclusions, that the transient results and the steady state results are essentially the same, so we were satisfied with that.

The ninth comment that we gave them --

LYNN MOORER: Excuse me.

JASON LEIBBERT: -- has to do with irrigation wells.

LYNN MOORER: Mr. Leibbert, on that comment though you also had in there in 2004 the -- your view that there are many residential water supply wells and irrigation wells located east of the plume boundary, and the model must be able to demonstrate these wells are not -- will not be impacted, and as a result of the well field -- Platte west well field pumping.

In the 2005 model they didn't include residential wells yet again, so do you want to revise your answer, you were satisfied that -- with what they did, because they, again, this time around, did not include residential well pumping in their model?

JASON LEIBBERT: Residential well pumping in the model is insignificant. It doesn't -- the model doesn't need to account for pumping from residential wells.

The -- just to the comment more as to illustrate where those residential wells lie, and they're not -- there isn't a figure in the report that has residential supply wells?

LYNN MOORER: (Shakes head.)

JASON LEIBBERT: They do everything except that one? Well, we could ask MUD to go back and do that again to show where all the residential wells are, maybe that's something we can amend our comments to.

NEW SPEAKER: (Inaudible comment.)

JASON LEIBBERT: Maybe another agency might have made that comment as well.

LYNN MOORER: Well, actually I think that your 2005 comments say you basically agree with what

the center of expertise said and what Harold Kolb's comments were, that's what your cover letter says --

JASON LEIBBERT: Yeah, those comments --

LYNN MOORER: -- and that was one of the criticisms in Harold Kolb's comments, that you didn't include -- they didn't include residential wells, so now are you changing your view or --

JASON LEIBBERT: Well, I'm not changing my view.

LYNN MOORER: -- did you just forget?

JASON LEIBBERT: I'm not changing my view. I guess I didn't remember that Harold made that exact comment in his comment letters.

When we wrote our comments back in February we'd seen Harold's comments, we'd seen the comments had from the CX at that point. All those comments are fair comments; we basically agree that MUD should address all of those questions as well.

LYNN MOORER: Just to clarify because you had said just a few minutes ago we were satisfied with what they did, and at least with respect to residential wells, I want to make sure that's what you really meant.

JASON LEIBBERT: Well, we agree with the comments that Harold had in his letters as well.

GERALD VERDUSKA: I didn't -- did I miss it or did you say what time -- what month of the year was it when those particles were put into the ground east of the plume to see what kind of movement, if there was any, do you remember what time of year it was?

JASON LEIBBERT: The particle tracking isn't --

SCOTT MARQUESS: Is --

JASON LEIBBERT: It's not really tied to as a specific month or a specific time of the year, but the way this simulation works in the model is it's kind of a what-if sort of question, a pretend.

And the scenario is pretend you can see one molecule of water, and as that one molecule of water moves over time you can -- you can watch it, you can see where it goes, every -- every step it makes you can see where it goes.

So the simulations, you know, that MUD did with particle tracking is you put a particle up here and then you turn the model on and you say, model, assume you're going to pump at 52 million gallons a day all day every day all year long for the rest of time, for infinity; where would that particle go.

And then the model does its calculations,

and it makes its predicted path and it shows where that particle goes and it also shows how fast it travels.

So in the 2005 report that MUD did, they put particles up here and then they went -- I'm not sure if it was exactly one-half mile, but they went about a half mile here, and then they did particles again, and then they said, you know, if this pumps at 52 million gallons a day where does that particle go, and then they said if this pumps at some other rate higher than 52, and I think they went all the way up to 104, where does that particle go.

And some of the simulations show that the particles go this direction or they go and then they come back around like this, you know, and it can take, you know, 10, 15, 20, 50 years for it to travel that way; that's what the particle tracking simulations do.

And I don't have it right in front of me, the conclusions were basically that the only time they could -- they could make a particle come all the way over here was if they pumped at 104 million gallons a day all day every day all year long every year from now until the cows come home.

GERALD: It seems like that would be an

almost impossible calculation to do unless you knew the conductivity with the river.

JASON LEIBBERT: Well, the riverbed conductance, the hydraulic conductivity, the storativity, the transmissivity, the precipitated, all those things factor into those calculations.

So as long as we're talking about it, this is what we talk about when we talk about sensitivity analysis for the model, and that basically says we tell the model, use this value for hydraulic conductivity, use this value for transmissivity, use this value for riverbed conductance, and then do the calculations and see what you get.

And then for the sensitivity analysis you say, well, what if I leave everything else the same but I change this one perimeter, if I change the conductivity to something else then what happens, do I get the same results, do I get different results, do I get drastically different results or do I get different results that are only small.

And that's how you would evaluate how sensitive the model is to those kinds of changes. The riverbed conductance is definitely an important factor. If you make some sort of guess about this

factor, and you get a result that says this particle goes from here to here in ten years, you know, that's -- you know, that would be a very --

GERALD: But what you're saying is that under the worst case scenario the highest conductivity the particle didn't move at all when you started out east of the plume?

When you started out at a half mile east of the plume in the worst case scenario it didn't move at all?

JASON LEIBBERT: I don't think that's what they did exactly.

GERALD: Okay.

JASON LEIBBERT: They -- what they did when they did their particle track analysis they were using the -- the calibrated version of the model, which is basically what they think is the best version.

You know, if they think they have a good value for the riverbed, they think they have a good value for conductivity, they think they have a good value for recharge, and they think that's a good match because they did the calibration process when they showed that the difference in water levels is small, that it's within acceptable ranges.

So starting with that, what they think is kind of the -- the best version, then they did those particle analysis -- those particle tracks, and they went all the way up to 104. It's all in the report.

GERALD: Did they -- in the model did they have a figure for an August -- the amount of gallons that comes down the valley per day?

JASON LEIBBERT: A figure for?

GERALD: Surface water and aquifer movement down the valley?

JASON LEIBBERT: Well, it -- I'm not sure, I don't know if they had -- I don't know if they gave something specific like that for August of a certain year.

GERALD: That seems like it'd be really useful.

SCOTT MARQUESS: I believe -- I don't believe there was a specific to a month, but it's got to be -- it's not just a monthly thing. It's got to be over some period of time that you'll get some representative output from the model I guess; would that be an adequate way to describe it?

So, no, there's not an August. There'd be lots of Augusts that we'd have to look at, so we'd have to have somewhat of a steady state or even a

transient over some period of time.

GERALD: The reason I chose August I was -- I think it's prudent to always take the worst case scenario.

SCOTT MARQUESS: Right, they do have some high stress conditions that they do model.

JASON LEIBBERT: Yeah, that's what I wanted to say as well. It's a little -- it's a little hard to explain, and it's a question really better posed to MUD because, you know, they can explain what they did better than I can explain what they did.

But to try to account for worst case things they used stage data from the river, like the lowest point. You know, they -- in some ways they tried to account for those worst case scenarios.

They -- I can't say that they used the worst case scenario for every single parameter every single time, but there's different points in the model where they did account for drought conditions, low stage levels in the river, I'm trying to think, low precipitation amounts so therefore you get less recharge which means more water has to come out of the aquifer.

So I don't think they did something

specific the way -- the way you described it, but they do account for worst case scenarios in some cases, yeah.

LYNN MOORER: Mr. Leibbert, could I ask of Mr. Marquess and Mr. Rendell?

Wouldn't it make sense for the purposes of what everybody wants to know about this area, that at least one year, if not maybe a couple years, in a row that they calibrate -- MUD calibrates its model to August rather than doing it to March or October?

I mean, in order to address what Mr. Verduska is talking about basically, to be to able to say this is -- these are the data that we have gathered from all of these different places that we've checked them on March or checked in them in August -- in October and say, here we are for August.

Let's calibrate it to here for now so we have a better read on what it's like after a couple of months of heavy irrigation pumping.

SCOTT MARQUESS: Yeah, I'd say that is a reasonable suggestion.

LYNN MOORER: Yes, it is reasonable; could you make that suggestion to them, or directive?

SCOTT MARQUESS: I can't --

LYNN MOORER: I'm sorry?

SCOTT MARQUESS: I cannot make directives to MUD. We make comments, suggestions; we are not -- we do not regulate MUD under the permit.

Can you make that suggestion, yes, we can.

LYNN MOORER: I would encourage you to make that suggestion and lobby hard for it.

DEBBIE CRANEY: Debbie Craney (phonetic), EPA.

I just have a question. I've been coming with Scott to these meetings for about a year and a half now, have -- has MUD been invited to these meetings and they've refused or why do they not come?

NEW SPEAKER: They don't care.

DEBBIE CRANEY: Well, they may not care, but --

LYNN MOORER: Who do want to answer that question?

DEBBIE CRANEY: Pardon me?

LYNN MOORER: Who do you want to answer that question?

DEBBIE CRANEY: The RAB chairs, Scott. I don't -- I don't -- it doesn't -- I'd just like to know. I mean, everyone's summarizing what MUD would

do; why -- have they been invited? Just curious.

SCOTT MARQUESS: MUD was here -- no, MUD has never been here. I don't believe MUD has ever been at a RAB meeting. The Omaha District was here one time and then elected not to attend further.

NEW SPEAKER: Has MUD been invited?

SCOTT MARQUESS: MUD -- I don't know that MUD would be invited.

GARTH ANDERSON: I do believe they have had some other public forums regarding the model.

LYNN MOORER: Not really, they have ceased --

GARTH ANDERSON: Well, they either have or they haven't. They have had other -- they did have a public forum at one time to the best of my knowledge.

LYNN MOORER: One.

SCOTT MARQUESS: There was -- was it January of '05 at the NRD.

GARTH ANDERSON: MUD had a meeting.

GARTH ANDERSON: So they have a public forum to discuss their operation.

LYNN MOORER: No.

GARTH ANDERSON: And as Jason pointed out, we're not here to explain MUD. We're here to offer

our review comments of the model, and that's where we need to get back on track, so --

LYNN MOORER: The EPA PR lady asked the question.

GARTH ANDERSON: I can't speak on behalf of MUD.

LYNN MOORER: That's why I asked who do you want to answer the question.

GARTH ANDERSON: We would all be surmising, so none of us can actually put words into MUD's mouth about why.

First of all, this is a -- you know, this is a forum to discuss environmental restoration at the Mead Super Fund Site.

LYNN MOORER: We talked about the models tonight. Okay. Let's move on.

JASON LEIBBERT: The ninth comment we gave to MUD back in 2004 had to do with the irrigation wells, and they provided a response.

And the way they did it again in the 2005 model I think needs some more explanation, so I think you guys have that in your comment, I think that's probably a pretty good comment.

LYNN MOORER: For the record, Mr. Leibbert, I respectfully remind you that a lot

of people can't attend these meetings.

They look to the transcripts to get substantive information, so if you could explain a little bit more of what the issue is or what is the comment, what's the criticism regarding each one of these, that would be helpful. It's like you've got a record here you need to create. Thank you.

JASON LEIBBERT: The record exists, but we'll do that.

LYNN MOORER: The point of these --

JASON LEIBBERT: We gave them a comment about how many irrigation wells they had in their model, and some of the assumptions and estimates they made about how those wells are operated.

And it's like we talked about a little while ago, is nobody is going to know when every single one of those irrigation wells turns on or turns off.

No one is ever going to know exactly how much pumping each well is going to do, so, you know, you kind of have to use the best information available.

The state registered well database has some of that information, but not all of it; the university can provide some of that information, but

not all of it.

There's -- I don't know if there's other sources or not, but there's -- there may be ways to get that kind of information, and probably none of them are going to be a hundred percent perfect.

So the way that MUD went about it in 2004 was okay, but not great --

LYNN MOORER: What --

JASON LEIBBERT: -- that's what we commented on, and then the way they went about that in 2005 was better but maybe still didn't answer the mail on everything, and that's why I think that comment is still on the table.

Anything more to add? You're shaking your head, you want to say something?

LYNN MOORER: If you could just summarize what they did and why that was inadequate.

I mean, they used less than half of the registered irrigation wells within Douglas, Sarpy and Saunders County that are registered with DNR, they used only about 550 irrigation wells even though they had said we will use all of the registered irrigation wells for 2005; that's one of the problems, is that not true?

JASON LEIBBERT: Well, if you say so. I

mean, they used half the wells, they used this number of wells, they used that number of wells; I mean, you know the facts, you know, you tell us.

I think the comment that you guys made in your letter is a good comment, and you pointed out some of these inconsistencies, and it's not really clear how many wells are in Sarpy County versus how many are in Saunders County and how many wells are active in the model and how many wells are not active in the model, that they need to do a better job of explaining that, and that's why I think you made that comment.

So, you know, it's incumbent on them to provide the response to that. It's not incumbent on me to speculate how MUD may or may not respond to that comment.

LYNN MOORER: Just to clarify, Mr. Leibbert, I'm not asking you to speculate. All I'm asking is that, if you can, to make this as useful for the record, what the nature -- what they did and how the Kansas City Corps' view is inadequate and that's it.

JASON LEIBBERT: Well, in --

LYNN MOORER: This is what they did, this is what we think is wrong about it.

JASON LEIBBERT: In the 2004 version of the model they did not do a very good job of simulating the irrigation wells, and we asked them to do something different, do something better, and we'll wait see and how they respond, if they got that same comment again.

LARRY ANGLE: Larry Angle, North Platte North NRD.

This really isn't a question, it's more of a comment on taking groundwater levels in August.

We currently have -- essentially between MUD and ourselves, we have currently ten monitoring wells that are monitored continuously.

We do ours every hour, their data loggers are set at least once a day. We're going to be installing five more, and those also will be monitored on an hourly base.

So from that 15 you'll have August records, you'll have July records, you'll have every hour of the year.

JASON LEIBBERT: The tenth comment that we gave to MUD back in 2004 had to do with the bedrock elevations that were used in the model, and we asked them to use more information regarding that.

We think maybe they weren't using all the

information that was available, and they responded to that and changed that, and we were satisfied with that.

The eleventh comment that we gave them has to do with the drain boundary, which is basically like we've talked about with Johnson Creek and the other streams and creeks in the model area.

It wasn't explained very well in the 2004 report, so they -- they responded to that with a better explanation, and we were satisfied with that.

The twelfth comment that we gave them has to do with transmissivity and using the -- well, it's an old document, it's by Sutter, and it's a commonly referenced document, that everyone that works in this area uses this reference.

And the question was what values of conductivity and saturated thickness were applied to the cells in the model domain, and MUD provided a response, and I think in the 2005 version of the report they addressed the transmissivity better.

The thirteenth comment, we noticed a difference between the model potentiometric surface versus the 1995 potential metric surface that was published by the Nebraska Conservation &

Survey Division.

And MUD was using that in reference to their calibration, and we didn't think that was a very good calibration target, and the explanation basically was that they weren't really using that as a calibration target; it was just something to compare against, and that explanation was satisfactory.

The fourteenth comment that we gave them, we asked them to better explain the staging data that they were using for the Platte River.

There's a number of gauging stations on the river that provide information about water levels during different parts of the year.

And their response was that they would expand the discussion of that and include all that gauging data, which is what they did, and we're satisfied with that.

The fifteenth comment that we gave them has to do with the way the water levels were simulated in the transient level, and the -- when you do a transient simulation you divide it up into different stress periods.

And the way the information was being passed from one stress period to the next was not

well explained, and they provided an explanation of that that was satisfactory.

The sixteenth comment that we gave them we asked for drawdown maps at the end of each stress period, and they agreed to do that, and we were satisfied with that response.

LYNN MOORER: So they did that?

JASON LEIBBERT: I think there's drawdown maps in the '05 report, isn't there? Do they have drawdown --

SCOTT MARQUESS: Yes, they do.

JASON LEIBBERT: Yes, they do.

LYNN MOORER: The irrigation wells, I mean, that's a major shall we say problem that remains.

JASON LEIBBERT: Well, we talked about the irrigation wells, that's still on the table. They still have more work to do in regards to explaining the irrigation wells.

LYNN MOORER: It would seem to just follow that if there were major problems with the irrigation wells and the assumptions they're using then the maps depicting that might also still have some problems associated or incompletenesses.

JASON LEIBBERT: Well, if they make

changes that would result in different drawdowns I would expect they would produce new drawdown maps.

No. 17, this had to do with the way the transient simulations were performed and kind of what was -- what was the starting point for the transient simulations, and then kind of building on a previous comment about doing a transient simulation that was longer than two years in duration.

And they responded to that. They did transient simulations that were longer and were able to illustrate that the conclusions from the transient simulations were really consistent with the steady state.

So that's all that Kansas City District comments on the 2004 version of the model, and let me get the 2005 model comments, they're much shorter.

So we got the 2005 version of MUD's model last fall, and in February, when we wrote them some comments about that, again as we talked about, we had already seen Harold's comments and we'd already seen the comments from the other Corps office in Omaha, the CX.

And the first comment that we gave them

about the '05 model was that we asked them to have their own public meeting to explain their model, and that MUD hasn't yet respond to all of these, so I'm not sure how they're going to answer that question.

GARTH ANDERSON: Just want to make sure that -- well, at I guess 10:24 the community co-chair had to leave early or leave before the completion of the meeting, so it wouldn't necessarily be reflected in the transcript. Thanks.

LYNN MOORER: And why did you want to put that in the transcript, Mr. Anderson?

GARTH ANDERSON: Because I think it would be important to note that if any -- any discussions happened at this point that there are no RAB members present to be part of the discussions.

JASON LEIBBERT: So the second comment that we gave them about the '05 report was to use the updated plume boundary maps, and in one of the figures they used an updated map and then in some of the other figures they still had the old stuff from 1997, so we asked them to correct that.

The third comment we gave them on the 2005 report, the explanation of other municipal supply wells like Ashland or Memphis; that wasn't explained very well so we asked them to better

explain how those municipal wells are accounted for in the model.

The fourth comment we gave them on the 2005 model again has to do with the irrigation wells and how those are included in the model.

And then the fifth comment that we gave them this year was about the City of Lincoln and their future expansion of the ability of the model to account for those higher pumping rates in the future if Lincoln goes through with those expansions the way they've described.

So that's all we have on the '05 model in addition to the stuff that you've given them, and since then EPA has given them comments, and those are all good comments as well.

GERALD:: Just one more question.

I was curious whether the model takes into account that Western Sarpy dike on the other side of the river, because I think -- I think they probably should if it doesn't because I think most hydrologists would agree that because the river is going to be confined and narrower and the velocity is going to increase and very likely the river will degrade deeper into the ground which could possibly impact the conductivities severely if it's a lower

elevation from now on.

JASON LEIBBERT: Do you know where that is in relation to?

GERALD: Just on the other side of the Platte from the well fields, and then going to the south.

JASON LEIBBERT: To the south?

GERALD: Yeah.

JASON LEIBBERT: Yeah, well that's a -- you know, the geometry or the way you described it, if the river is confined it's going to react differently, that's -- I can't say for certainty if that is or isn't in the 2005 MUD model.

GERALD: You know, with the -- since the Missouri has been channelized, it's degrading into the ground, and the Platte is degrading to match it, but it'll degrade faster with the velocity being increased during higher storm water flows.

JASON LEIBBERT: Well, that's a -- no, that's an interesting comment. I'm not sure how they -- in the model they can describe how wide the river is, how deep the river is, but I'm not sure -- you know, I can't say what they did at any one particular point, but that's a good question, we'll have to look into that one.

HAROLD KOLB: I've got several questions here. Name is Harold Kolb. Is this time for questions?

JASON LEIBBERT: Yes.

HAROLD KOLB: Okay.

GARTH ANDERSON: I think that started a long time ago.

NEW SPEAKER: Yeah, about four hours ago.

HAROLD KOLB: Well, a couple of hours ago you made the comment that the reviewers said that all the -- these remarks were adequate on the -- I don't remember exactly the comments, I think Mr. McCollum made those, that they were adequate, that all these inputs were adequate or whatever.

But it seems to me that they didn't use any of the latest data on that stuff. They didn't have the number of wells, they didn't have the Lincoln well fields, they don't even have the soil types, yet they say all this stuff is adequate; how -- it's adequate using inadequate data so it's totally worthless.

And when it comes to the number of wells--I wish Mr. Angle would have stuck around--they know exactly how many wells are in Saunders County.

It's not hard to find, it's like on the web, Lincoln well field, you can call them, you can go to a meeting; it's easy to find that data. Make them put it in there.

Soil types: Through this organization of the EPA and whoever, they probably punched a million holes in this area; if they don't know the soil types by now they all should be fired.

It just -- it's crazy the way you guys push around excuses; oh, we don't know this data or we don't have this. It really makes you look bad to anybody that understand what's going on around here.

And then there's a lot of things from the Design Groundwater Model 3 that were addressed, and they're still being addressed in No. 4; it's like how long are you going to let people just keep going on and on and say, well, we'll work on this, we'll work on this.

I wish you guys could go to work for the IRS, so that if I'm late, we'll just work on it. I mean, it's -- this is -- you know, and you talk about everything's on the web, and MUD puts things on the web.

If you look at the front page, it says right in there, you talk about, well, they're only

going to pump 50 million gallons a day. It says right on there in big words, we have expanded our pumping by 104 million gallons per day. It doesn't say up to or once in a while; it says 104 million gallons a day.

So run your simulations according to what they say instead of, oh, you know, well, we'll be good, we don't do this; they're going to do it.

And then, yeah, we talked about the August drawdown versus the March drawdown. Corn doesn't get real thirsty in March, it's still in the bag someplace, so that's ridiculous to not use the August and September drawdowns because the drawdowns follow the pumping a little bit.

Mr. Marquess said that the EPA can't control what MUD does. You can control what a hog farmer down here down the road five miles does, but if MUD wants to suck all this stuff straight east you're just going to say, gee, that's too bad.

SCOTT MARQUESS: I'll address that.

HAROLD KOLB: Okay.

SCOTT MARQUESS: I mean, we do not regulate MUD under their permit, right?

HAROLD KOLB: Okay.

LYNN MOORER: Talk about all the ways you

can regulate them.

SCOTT MARQUESS: We have the ability to influence the situation with these guys, with the Corps, in terms of the clear up under the federal facility agreement. We also have an indirect role in affecting the overall relationship between MUD and the plume.

And we will observe that entire -- and it's not an isolated situation where there is no relationship. We'll observe it, we'll see what's going on, and when irregularities, problems arise, we will bring them to the attention of everybody involved who has a hand in remedying that situation.

HAROLD KOLB: So will you stop the pumping if the plume moves? Will you tell these guys to tell Omaha to stop the pumping because you're contaminating -- they all worry about MUD's wells, what about the 500 people or thousand or whatever that live between where that pretty little line is now, and the east; don't they count?

SCOTT MARQUESS: The intent of this operation, the OU2 ROD says thou shalt not allow the extent of this containment to expand basically beyond what it is right now, and that's the criteria that we intend to ensure is enforced.

HAROLD KOLB: So we have the EPA's word on it that it will not go east of that, and if it is, whoever causes it, will stop it from going east?

SCOTT MARQUESS: That's the intent, yes. The plume is not supposed to move east, south, north, west, anywhere beyond from where it is right now. That's the ROD -- that's what the record of decision says.

HAROLD KOLB: And in five years after they start pumping, if that plume is moving a whole lot more than your pretty little computers show -- your little computers here say, you will make them stop pumping?

SCOTT MARQUESS: We'll have to see why it's -- you know, what's happening, why is it happening? Has the containment system failed, is there plume past to the south. There could be any number of causes that would -- that may impact the plume to expand.

HAROLD KOLB: Well, 104 million gallons a day is probably a significant cause.

SCOTT MARQUESS: Well, if there's plume movement to east then we'll have to take steps to address it.

Yes.

LYNN MOORER: He asked you a yes or no question, will you --

SCOTT MARQUESS: Well, this isn't a court of law and it's not an inquisition, and I'll answer the way I see fit, so thank you very much.

LYNN MOORER: Well, you're not answering his question.

HAROLD KOLB: One more. So, Jason, when this next groundwater model comes out as of -- I mean, MUD is supposed to put one out, what, every six months after they start going and every year until they start pumping if I remember right, and you guys are going to have a groundwater model out in September -- or later this year we'll say, so that all these concerns that are addressed in here from everybody else will totally be answered; is that -- are you going to answer all of these questions, and I mean, you have from now to September to get all this stuff digested and answered, so will you answer all those?

JASON LEIBBERT: Well, we're going to address the comments that were directed to us about the work that we've performed to date, and we're going to continue to do this, where we take what the model tells us, check it against what we actually

see in the real world, and then decide if that's a good match or not a good match, and then go back and put that information back in the model.

So what are we going to do between now and September, we're going to do this cycle, we're going to make our model better by using all the information that's available to us, and addressing the comments that we got in the past.

Now, what's MUD going to do every six months or every -- you know, that's not for me to say. If the permit says they have to do something every six months, then I guess they'll do it every six months. I mean, I don't know what they are.

HAROLD KOLB: I understand that, but you can also -- you guys have a hammer as far as the comments to what their water model says, and if they continually do not put in the perimeters at the top of those signs that says actual site information, if they don't do that this time are you going to say, hey, guys, clean up your act and we'll -- because you can only consult with Omaha, are you going to tell Omaha, get these guys to do something, and I -- I guess by -- if you're going to follow that little circle, then actual site data will include number of wells, perfect soil data, so there should be no

comments on any of that.

JASON LEIBBERT: Well, you know, if they have the comments then we'll see how they respond to those, and maybe their response will be satisfactory and maybe it won't, and if it's not then -- then maybe we -- they go through this exercise again where they revise the model and update it and release a new report.

HAROLD KOLB: So if ten years from now we're still producing reports with old data and they're pumping the valley dry and most likely moving the contaminants, but we're still going through data -- going through all the models with old data.

JASON LEIBBERT: Well, you can say that if you want, but ten years from now we'll probably still be in this cycle, yeah, because this cycle --

HAROLD KOLB: (Inaudible response) that cycle all the time, but --

JASON LEIBBERT: Yes.

HAROLD KOLB: -- you should start with the very top one, I mean, actual site data, I mean, that doesn't mean actual site data from ten years ago, it means from right now.

JASON LEIBBERT: Right.

JOHN KNAPP: My question -- John Knapp.

My question is kind of back to the -- on the -- my initial question was, okay, if -- when you run your model you compare your results on the web -- static level in the wells.

So, for instance, right now you're saying in MUD's model they did not use irrigation data and current Lincoln well field data, and so their model if it's -- evidently it's somewhat to your satisfaction, is predicting these levels, okay.

This data wasn't in, so now -- now when they come in, when they input this data into the model, that means something else has to give to get this -- this resolved, so which -- so you got a whole bunch of variables there. You're talking about conductivity, there --

JASON LEIBBERT: A lot of them.

JOHN KNAPP: A lot of them, so how do you know which part of your model -- which one of the other perimeters has failed?

I mean, if I -- I can change -- if I change the irrigation -- amount of water the irrigation wells are pulling out, that means I can -- I can adjust my conductivity so that this -- this fits, but I could also change my conductivity

and something else and it would still fit, so how are you guys deciding which is the real -- whose -- which is the real thing that we've guessed -- you've obviously guessed wrong if it's making a prediction without this other data, and so how do you get the right one corrected?

JASON LEIBBERT: It's a -- that's actually a very good question.

There are a lot of variables, and if you change any one of them, you kind of change the final conclusion, you know, if you change this one, you know, you get a different answer every time you change one of the variables, so that's definitely true.

The way a modeler deals with that question is you do a sensitivity analysis, and you look at those variables and you -- you modify those variables one at a time to see what sort of different answers you get from the model, and sometimes, you know, depending on, you know, what you're trying to simulate in your model, the model may be very sensitive to something like conductivity.

If you change the conductivity just one little bit you get this big different answer, you

know, it makes a huge change in what happens, and then other times the model may not be very sensitive to something.

You can change this perimeter and it really doesn't change the bottom line, it really don't really affect the bottom line, so the reason you do that is to try to home in on what's really gone on in the model, what's really important and what are those critical factors that need to be done just right in order for the model to calibrate well, to get that good match to those static water levels.

You know, the practice is that anybody that does a model would go through this kind of analysis, you know, that's just -- you know, that's what a good modeler does, but there's no -- there's no cookbook or there's no recipe that tells you do this, do this, do this, do this, so it's -- there's some subject -- subjectiveness in that process.

We did it in our RDGM model, and Dr. Zurbuchen from DEQ gave us a lot of comments about that. He didn't like the way we did it. He had suggestions on how to do it better the next time, so we're going to follow those suggestions.

MUD does it in their model. We had comments about that, so it's one of those things

that you continue to work on is to try to get those -- all those different variables down to a range that does a good job of matching what you see in the real world.

You know, it -- if you change one what happens to the other ones and where do the changes come from, it's a little more complicated than that but you're on the right track, that if you change one variable you can have a greatly different answer in the end if the model is sensitive to that.

If the model is not sensitive to that then maybe that basically tells you that either you did a good job of estimating that perimeter or it tells you that that perimeter is not as important as these other ones, and that, you know, your time is better spent focusing on those perimeters that the model is very sensitive to and have the most effect and can result in the most change when you -- when you do that analysis.

So I'm not sure if that answer -- it -- it's not exactly an easy answer. You know, the modeling is not simple, I wouldn't portray this as a simple exercise.

Dr. Zurbuchen, that's basically how he got his Ph.D., is his modeling, and he's very

knowledgable about it and he's spent a lot of time on it.

The guy that we have working for us, you know, is at a similar level of Dr. Zurbuchen, he doesn't have a Ph.D., but he's done a lot of work.

The number of people that are really experts in modeling is actually pretty small. You know, USGS has a lot of expertise, and there's a few firms that have this kind of specialized capability, so it's not a simple thing. Not anybody can just, you know, start plugging away and come up with a model that's good.

So it's -- it's not a simple exercise is what I'm trying to say and there's no easy answers about the model, and, you know, if you remember some of the math that Greg had in his slides, you know, that's what we're talking about here.

All these discussions about conductivity and transmissivity and all that, we're talking about the math, and not too many of us left in the room here can actually follow all the math. I have a hard time with the math myself. I like the computers that -- the programs that actually do the math for you.

So, you know, manipulating those variables is an important part of the process and it helps you

focus in on the variables that are the most important, and it's one of those things you just have to keep working at it.

You know, they've done it, they've gotten comments from us, they've gotten comments -- I think EPA commented about their sensitivity analysis, and that's probably going to be a recurring thing.

LYNN MOORER: Mr. Leibbert, for the record, for the comment -- the Kansas City Corps' comments on the 2005 MUD model, who wrote the comments on -- that were, you know, your Page 1 and 2, this addendum thing or the thing that's the attachment, who wrote those comments?

JASON LEIBBERT: Kansas City District.

LYNN MOORER: No, who? Did you write them?

JASON LEIBBERT: In consultation with other people on our team, yeah, it was a group effort.

LYNN MOORER: Could you identify those persons?

JASON LEIBBERT: Mazud Zaman --

LYNN MOORER: I can't hear you, I'm sorry.

JASON LEIBBERT: Mazud Zaman, Matt Wilson, Mary Lyle, myself, I think that's everybody.

LYNN MOORER: And who wrote the letter that Mr. Anderson signed dated February 1st, that cover letter to that?

GARTH ANDERSON: Once again, it's the -- Garth Anderson.

It's a team effort; we write it and I sign it, and that's the position of the Kansas City District.

LYNN MOORER: So was it the same individuals he named?

GARTH ANDERSON: Yes.

LYNN MOORER: And you were a part of the team also, Mr. Anderson --

GARTH ANDERSON: I'm the project manager, yes.

LYNN MOORER: -- in terms of the result of this letter?

GARTH ANDERSON: I'm the project manager, leader of the team that does the work on this site, yes.

LYNN MOORER: I just asked if you were part of the team that came up with these comments.

GARTH ANDERSON: Absolutely.

LYNN MOORER: All right. Then who were the individuals who came up with the comments on --

for the Kansas City Corps for the 2004 MUD model?

JASON LEIBBERT: Basically the same group. It was basically the same group in 2004.

LYNN MOORER: Is it all the exact same individuals?

JASON LEIBBERT: In 2004 we had Vicki Murt help us review that --

GARTH ANDERSON: I was not part -- Garth Anderson.

I was not a part of the project team in 2004.

JASON LEIBBERT: I think that's the only difference.

LYNN MOORER: So you add Vicki Murt, if that's the name, to the team and subtract Mr. Anderson and it's the same?

JASON LEIBBERT: (Nodding head.)

LYNN MOORER: All right. Thank you.

GARTH ANDERSON: Well, it looks like that's a wrap. I appreciate everyone sticking around for so long. For those of you that are left, for the eight of you that are left, there is another RAB meeting on April 6th right here, 7 o'clock, also an open house from 4 to 6 where we'll -- if you have any specific questions, data, queries or what have

you, you can just talk to us one on one, we'll be here. Thank you.

(10:55 p.m. - Adjournment.)

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